

Best Practices #176

Best Practice Title: Best Practices in Performing DSA Legacy Reviews

Facility: EFCOG SAWG, LLNL

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Brief Description of Best Practice: This is a toolbox of best practices developed for reviews of legacy issues that may be present in Documented Safety Analyses (DSAs). These best practices for DSA Legacy Reviews have been found to efficiently and effectively review DSAs to improve quality and ensure compliant implementation with 10 CFR 830. This collection spans a variety of techniques and provides a toolbox for reviewers. Techniques include:

- comprehensive DSA legacy reviews on a per-facility basis,
- focused/targeted reviews on a topical, cross-facility basis (e.g., SACs), and
- interface with other processes (e.g., TSR implementation, safety basis development procedures, training).

Why the best practice was used: DOE sites need to monitor DSA quality and compliance to ensure a 10 CFR 830 Compliant DSA development process. Legacy issues can be a result of the initial rush to develop compliant DSAs after 10 CFR 830, associated learning curve, maturation of the DSA development process, better understanding of issues over time, and/or facility-specific situations. Examples of legacy issues may include legacy assumptions, safety basis parameters or conditions, issues with control flow down, inconsistent controls. Accordingly, this toolbox provides a variety of reviews and assessment methodologies ranging from comprehensive assessments on a per-facility basis to focused/targeted reviews on a topical, cross-facility basis. Additionally, these reviews interface with other processes (e.g., TSR implementation) and may result in the need to revise safety basis development procedures and/or associated training or lessons learned. This best practice paper will aid in assessing, verifying and documenting that the DSAs have been reviewed for legacy issues and quality improvements.

These tools provide a method to ensure that necessary actions are taken to: (1) support the reviews, including providing clear guidance as to expectations; (2) conduct the reviews appropriately; (3) provide recommendations to revise DSAs as appropriate; and (4) provide feedback of lessons learned to safety analysts and facility management. These tools help the safety basis subject matter expert (SME)/Functional Area Manager (FAM) assess trends, develops lessons learned, and provides feedback resulting from the reviews.

What are the benefits of the best practice: SAWG believes that the proposed recommendations will help ensure Compliance, proactively find DSA legacy issues and highlight opportunities for improvement while streamlining the review process, increasing its efficiency, effectiveness, and timeliness. This best practice can help improve consistency across facilities on common topics and minimize DSA legacy issues.

What problems/issues were associated with the best practice: Opportunities exist to review DSAs for legacy issues that some contractors may not be aware of, and thus may be vulnerable for DSAs with quality or implementation issues. This best practice highlights review topics for consideration.

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How the success of the Best Practice was measured: This best practice paper has helped to minimize DSA legacy issues, ensure Compliant DSAs, optimize the DSA development process, while streamlining the review process, increasing its efficiency, effectiveness, and timeliness. Improvements have included:

- Improved consistency across facilities on common topics,
- Minimized legacy issues,
- Optimized DSA revision processes,
- Developing revised safety basis procedures based upon DSA legacy reviews,
- Developing and revising safety basis training,
- Management/DSA Interfaces.

Description of process experience using the Best Practice: See attached documentation of best practices which are templates for:

- Comprehensive DSA Legacy Reviews on a per-facility basis, and
- Focused/targeted reviews on a topical, cross-facility basis (e.g., SACs).

Comprehensive reviews of a specific DSA are a best practice to find DSA legacy issues (e.g., legacy assumptions, safety basis parameters or conditions) associated with references (e.g., safety basis calculations), flow down of controls, and other topics. Lessons learned from several DSA Legacy Reviews highlight that advanced selection of calculations proved beneficial (i.e., first find all calculations referenced in the DSA, track down the actual calculations, and review the calculations for relevance and priority).

Comprehensive reviews of a specific topic across DSAs are also a best practice to find DSA legacy issues. Reviews of specific topical areas are also when issues repeatedly arise in an topical area or when a specific topical area has not recently received a fresh look. Topics may include chapters (e.g., DSA safety management program chapters), broad topics (e.g., site natural phenomena hazards), or specific topics (e.g., Specific Administrative Controls (SACs)).

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Comprehensive DSA Legacy Reviews on a per-facility basis

Comprehensive reviews of a specific DSA are a best practice to find DSA legacy issues (e.g., legacy assumptions, safety basis parameters or conditions) associated with references (e.g., safety basis calculations), flow down of controls, and other topics. See the following review template.

Lessons learned from several DSA Legacy Reviews highlight that advanced selection of calculations proved beneficial (i.e., first find all calculations referenced in the DSA, track down the actual calculations, and review the calculations for relevance and priority).

Review Plan for DSA Legacy Issue Review Template

I. Objective/Purpose

The purpose of the Management Self-Assessment is to, "Assess an existing Hazard Category 2 or 3 nuclear facility DSA for legacy assumptions, safety basis parameters or conditions." This review verifies that the DSA is constructed in accordance with [DOE site contractor] requirements and demonstrates application of current guidance (Ref. ###). This subject has been previously assessed by the Department of Energy (DOE), both by [DOE site contractor] and Headquarters(see Ref. ###).

This review identifies findings in accordance with the terminology defined in *PRO-00##* (Ref. ###):

- Deficiency:** A condition, event, procedure, or operation that is not in compliance with the requirements of applicable federal, state, and/or local laws and regulations, the Contract, or the [DOE site contractor]-specific implementing procedures/manuals.
- Observation:** A compliant condition, event, operation, or practice that warrants action tracking or is included for trending purposes to identify future potential areas for improvement.
- Strength:** A practice or condition that is especially efficient, effective, or beyond normal performance expectations.

Findings are further identified as either "Routine" or "Priority."

II. Scope

The scope of the review is the [specific facility] DSA/TSR (Ref. ###). This review examined individual analytical references in the DSA as well as the overall DSA analysis. The Assessment Team identified key analytical references from among those cited in the DSA. All Safety Basis Division calculations cited in the DSA were reviewed. Other significant

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references were reviewed as well. Minor references did not require formal review. The references selected for review are listed under Line of Inquiry #1 in Section III of this report.

III. Methodology, Lines of Inquiry, & Criteria

This is a Management Self-Assessment conducted per *PRO-00##*. The MSA is included in the Integrated Assessment Program (IAP) and was approved by the Nuclear Operations Functional Area Manager. The methodology used was a combination of facility walk down, document review and interviews as necessary. This review report summarizes results as noted below, with detailed attachments covering the major areas of review

The following lines of inquiry were selected based on the results of previous reviews (Ref. ###). Per *PRO-00##*, they "utilize the results of relevant MOVIs to develop CRADs/lines of inquiry for the MSA."

1. Do the references reviewed correctly reflect [DOE site contractor] requirements (Ref. ###) and are consistent with the DSA? ¹
 - a. Do the Safety Basis Division (SBD) calculations referenced in the DSA contain appropriate input assumptions, calculations and reach consistent conclusions accordingly?
 - b. Do other references reviewed contain appropriate input assumptions and conclusions consistent with the DSA?

At the conclusion of the reference review, the reviewers shall identify:

- (1) any inconsistencies with the DSA,
 - (2) any input assumptions not properly reflected in the DSA, and
 - (3) any calculations that should be revised.
2. Does the DSA review indicate satisfactory internal consistency? The review will be conducted conceptually consistent with the standard precepts of an annual update

¹ The detailed review steps are as follows:

- Verified any software used in the above calculations is on the [DOE site contractor] Safety Software List.
- Determined which calculations are still relevant to the analysis.
- Determined if older calculations should be upgraded into new calculations.
- Verified that calculations still relevant to the analysis meet the requirements of procedure AB-###, *Safety Basis Calculations*.
- Verified computational results of calculations still relevant to the analysis.
- Verified consistency with the DSA text and conclusions.
- Evaluated the calculations to determine if any key assumptions were unacknowledged in the DSA analysis and/or TSR control flow down, as appropriate.

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review, with the exception that this review does not focus on changes only. The review will examine the hazard identification, hazard evaluation, accident analysis, and control flow down through Chapters 4 and 5 into the TSR document. The review will focus on consistency in control derivation and flow down, explanation of the bases thereof, and the potential presence of unacknowledged assumptions.²

- a. Are the hazards identified consistent with the hazard evaluation and accident analysis?
- b. Do the controls flow down consistently within the DSA from the hazard evaluation and accident analysis to the TSRs?
- c. Are key assumptions unsupported or left unaddressed?

At the conclusion of the DSA review, the reviewers shall identify:

- (1) any inconsistencies in control flow down,
- (2) any unsupported or unaddressed assumptions, and
- (3) any DSA revisions required.

Any findings and associated potential DSA revisions are identified as either "Routine" or "Priority." Routine findings can be addressed in the next annual update. Priority findings should be addressed as soon as practicable. Both Routine and Priority findings are categorized according to the terms defined in PRO-00##.

IV. Schedule

The start date was [date]. Per PRO-00##, the Assessment Team conducted an "...entrance meeting as required with affected organization/facility owners (include Assessment Response Owner)." A draft report was issued for factual accuracy review by [date]. Final report will be issued [date]. Per PRO-00##, the Assessment Team conducted an exit meeting as required with affected line management, organization, facility owners, and the Assessment Response Owner.

V. Team

The Assessment Team Leader (Safety Basis Division Leader), Safety Basis Deputy Division Leader, the Safety Basis Division Institutional Reviewer of [facility], [facility] Safety Basis Manager, and their staff will conduct the review. The Assessment Team has the skills, knowledge, and abilities (SKAs) necessary to evaluate compliance to the specified requirements.

In accordance with PRO-00##, the Management Self-Assessment Team Leader (Safety Basis Division Leader) and the Safety Basis Deputy Division Leader completed the required training (###). Team members/individual assessors meet training and qualification

² Lessons learned from the previous DSA Legacy Review on advanced selection of calculations proved beneficial.

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requirements determined by the manager (NucOps FAM) authorizing the MSA. The other team members reviewed PRO-00## (Ref. ###) and demonstrated their understanding of the process to the selecting manager.

Details of Review Approaches – Example of Broad DSA Legacy Review of 1 Facility

Note: This example requires a large team (e.g., 6 SMEs) and sufficient time (e.g., 3 months) to conduct a thorough DSA Legacy Review.

This section of the template provides detailed direction to conduct these lines of inquiry and may be included as an Appendix in the final DSA Legacy Review report. Lessons learned indicate that review tasks should be assigned to subject matter experts (SMEs) in a specific topic. For example, CFAST SMEs should review fire related calculations, Hotspot and MACCs SMEs should review radiological release calculations, ALOHA and EPICode SMEs should review toxicological release calculations, airplane crash SMEs should review airplane crashes.

I. Supporting References

All relevant Safety Basis Division authorization basis (AB) calculations are to be reviewed. All such calculations are numerically verified.

Select calculations not performed by the Safety Basis Division are reviewed as well based on judgment of potential significance. These calculations do not require full numerical verification. They are reviewed in a primarily qualitative manner to verify the analytical logic is sound and the overall conclusions consistent with the DSA/TSR text.

First, search the DSA for all relevant calculations. Second, obtain and organize all the relevant calculations in a central location/file server for the review team. Third, list the calculations in an Appendix to the Review Report. Lessons learned indicate that finding such legacy calculations may not be at first obvious in DSA citations or the records themselves.

A. Identification of Relevant Safety Basis Division AB Calculations

Review Steps

- a) Verify any software used in the above calculations is on the [DOE site contractor] Safety Software List.
- b) Determine which calculations are still relevant to the analysis.
- c) Determine if older calculations should be upgraded into new calculations.
- d) Verify computational results.
- e) Verify consistency with the DSA text and conclusions.
- f) Evaluate the calculation to determine if any key assumptions are unacknowledged in the DSA and/or TSR control flowdown, as appropriate.

B. Other Calculations (e.g., structural, plane crash) to Qualitatively Review

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- a) Verify any software used in the above calculations is on the [DOE site contractor] Safety Software List.
- b) Determine which calculations are still relevant to the analysis.
- c) Qualitatively verify that the conclusions of these calculations match the DSA text and conclusions.
- d) Evaluate the calculation to determine if any key assumptions are unacknowledged in the DSA and/or TSR control flowdown, as appropriate.

II. Other Calculations That Probably Don't Need Review

Consider which calculations are already reviewed sufficiently through other peer review or independent review processes by relevant SMEs in other topics, e.g., Criticality Safety Evaluations by Criticality Safety SMEs, seismic calculations by appropriate SMEs, etc.

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Details of Review Approaches – Example of Narrower DSA Legacy Review of 1 Facility

Note: This example may utilize a smaller team (e.g., 4 SMEs) and sufficient time (e.g., 1 – 2 months) to conduct a more narrow DSA Legacy Review. Alternatively, this example may be used with a large team and longer time period (as in the broad example above) for a complex DSA.

As in the broad example above, this section provides detailed direction to conduct these lines of inquiry and may be included as an Appendix in the final DSA Legacy Review report. Lessons learned indicate that review tasks should be assigned to subject matter experts (SMEs) in a specific topic. For example, CFAST SMEs should review fire related calculations, Hotspot and MACCs SMEs should review radiological release calculations, ALOHA and EPICode SMEs should review toxicological release calculations, airplane crash SMEs should review airplane crashes.

Two sections of the review (Scope and Methodology, Lines of Inquiry, & Criteria) are more targeted in this narrow example. First, identify and review relevant prior reviews, findings (both contractor and DOE), and other documents that may help focus the review on the highest priority potential DSA legacy issues. Second, search the DSA for all relevant calculations. Third, obtain and organize all the relevant calculations in a central location/file server for the review team. Fourth, list the calculations in an Appendix to the Review Report. Lessons learned indicate that finding such legacy calculations may not be at first obvious in DSA citations or the records themselves.

I. Scope

The scope of the review is the [facility] DSA/TSR (Ref. #). This DSA, however, is too large and complex to attempt a complete review of every aspect in a single MSA. Based on the findings in previous reviews, [list selected topics] topics were identified for review in this MSA: [list selected topics].

The [facility] DSA calculations are identified and assessed to fall into several broad categories [narrow list based on review of previous reviews discussed above]:

1. Natural Phenomena Initiator Strength Specification
2. Structural Calculations
3. Chapter 3 Calculations (hazard and accident analysis)
4. Airplane Crash Calculations
5. Chapter 4 calculations (safety SSC)

Therefore, this MSA will review only [selected categories].

II. Methodology, Lines of Inquiry, & Criteria

This is a Management Self-Assessment conducted per *PRO-00##*. The MSA is included in the Integrated Assessment Program (IAP) and was approved by the Nuclear Operations

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Functional Area Manager. The methodology used will be a combination of facility walkdown, document review and interviews as necessary.

The following lines of inquiry were selected based on the results of previous reviews (Ref. #). Per PRO-00##, they "utilize the results of relevant MOVIs to develop CRADs/lines of inquiry for the MSA."

1. Do the calculation references reviewed correctly reflect [DOE site contractor] requirements (Ref. #) and are consistent with the DSA?³
 - a. Do the Safety Basis Division (SBD) calculations referenced in the DSA contain appropriate input assumptions, calculations and reach consistent conclusions accordingly?
 - b. Do other references reviewed contain appropriate input assumptions and conclusions consistent with the DSA?

At the conclusion of the reference review, the reviewers shall identify:

- (1) any inconsistencies with the DSA,
 - (2) any input assumptions not properly reflected in the DSA, and
 - (3) any calculations that should be revised.
2. Does the DSA Chapter 3 review indicate satisfactory clarity and internal consistency? The review will examine the hazard identification, hazard evaluation and accident analysis. It will focus on coverage for the hazards identified, clarity of the individual hazard and accident analysis scenarios, correlation of individual scenarios to control designation, explanation of the bases thereof, and the potential presence of unacknowledged assumptions.
 - a. Are the hazards identified comprehensively evaluated in the hazard analysis?
 - b. Are individual hazardous scenarios clearly identified and evaluated in a manner that correlates with consequence and frequency ranking?
 - c. Are individual hazardous scenarios clearly identified and evaluated in a manner that correlates with specific control designation?

³ The detailed review steps are as follows:

- Verified any software used in the above calculations is on the [DOE site contractor] Safety Software List.
- Determined which calculations are still relevant to the analysis.
- Determined if older calculations should be upgraded into new calculations.
- Verified that calculations still relevant to the analysis meet the requirements of procedure ###, *Safety Basis Calculations*.
- Verified computational results of calculations still relevant to the analysis.
- Verified consistency with the DSA text and conclusions.
- Evaluated the calculations to determine if any key assumptions were unacknowledged in the DSA analysis and/or TSR control flow down, as appropriate.

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- d. Do the individual accident analysis scenarios correlate with the hazard analysis?
- e. Do the individual accident analysis scenarios present a complete and consistent scenario definition with technically appropriate unmitigated and mitigated consequence estimates?
- f. Are key assumptions unsupported or left unaddressed?

At the conclusion of the DSA review, the reviewers shall identify:

- (1) any lack of appropriate clarity and definition,
- (2) any unsupported or unaddressed assumptions, and
- (3) any DSA revisions required.

Any findings and associated potential DSA revisions will be identified as either "Routine" or "Priority." Routine findings can be addressed in the next annual update. Priority findings should be addressed as soon as practicable. Both Routine and Priority findings are categorized according to the terms defined in PRO-00##.

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Focused/targeted reviews on a topical, cross-facility basis (e.g., SACs).

Comprehensive reviews of a specific topic across DSAs are also a best practice to find DSA legacy issues. Reviews of specific topical areas are also when issues repeatedly arise in an topical area or when a specific topical area has not recently received a fresh look. Topics may include chapters (e.g., DSA safety management program chapters), broad topics (e.g., site natural phenomena hazards), or specific topics (e.g., Specific Administrative Controls (SACs)). See the following review template.

Specific Administrative Controls (SACs) Review Report

I. Objective/Purpose

The purpose of the Management Self-Assessment is to assess existing Hazard Category 2 and 3 nuclear facility Technical Safety Requirements (TSRs) with regard to Specific Administrative Control (SAC) safety function and functional requirements (Ref. ###). This review verifies that the TSRs' SACs have safety functions and functional requirements which are complete and correct from an Operations perspective.¹ This subject has been previously assessed by independent contractor review teams and the Department of Energy (DOE), including both [DOE site] and Headquarters personnel (see Ref. ###).

This review identifies findings in accordance with the terminology defined in *PRO-00##* (Ref. ###):

- Deficiency:** A condition, event, procedure, or operation that is not in compliance with the requirements of applicable federal, state, and/or local laws and regulations, the Contract, or the [DOE site contractor] specific implementing procedures/manuals.
- Observation:** A compliant condition, event, operation, or practice that warrants action tracking or is included for trending purposes to identify future potential areas for improvement.
- Strength:** A practice or condition that is especially efficient, effective, or beyond normal performance expectations.

Findings are further identified as either "Routine" or "Priority."

¹This Operations review does not verify that the DSAs/TSRs are constructed in accordance with [DOE site contractor] requirements and demonstrate application of current guidance. That is done separately, as part of the DSA Legacy Review process documented.

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II. Scope

The scope of the review is the SACs contained in the [list of all facilities] DSAs/TSRs (Ref. ###).

III. Methodology, Lines of Inquiry, & Criteria

This is a Management Self-Assessment conducted per *PRO-00##*. The MSA is included in the Integrated Assessment Program (IAP) and was approved by the [facilities'] Program Leader. The methodology used is a combination of facility walkdown, document review and interviews as necessary.

DOE-STD-3009, CN3, discusses a SAC safety function as follows:

This subsection states the reason for designating an administrative control as a SAC, followed by specific identification of its preventive or mitigative safety function(s) as determined in the Chapter 3 hazard and accident analysis. Do not discuss non-safety functions.

Safety functions are top level statements that express the objective of the SAC in a given accident scenario. For example, the safety function of a Material at Risk limit could be stated as: "To limit the total quantity of nuclear material present within the facility to no more than 2000 Curies." The specific accident(s) or general rationale associated with the safety function should be identified.

This description is reasonably clear in terms of the specific content desired.

DOE-STD-3009, CN3, defines a SAC functional requirement as follows:

This subsection identifies requirements that are specifically needed to fulfill safety functions. Such functional requirements are specified for both the SAC and any needed support SSCs.

Limit functional requirement designation to those requirements necessary for the SAC safety function. Functional requirements are provided for SACs for the specific accident(s) or general rationales for which the SAC is needed.

For SACs, functional requirements may involve unimpeded access to specific rooms or areas, use of certain instrumentation, written procedures or checklists, and special tooling. The description of the functional requirement must fully address all aspects important for ensuring the SAC can be accomplished

This description is less clear in terms of the specific content desired. That is particularly the case for functionally simple SACs (e.g., MAR limits, specific prohibitions). In many cases, DSAs rephrase the safety function as an introductory sentence to the functional

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requirement. Subsequent text delineates either any unique functional requirements or general implementation requirements (e.g., procedures).

The following lines of inquiry were selected based on the results of previous reviews. Per PRO-00##, they “utilize the results of relevant MOVIs to develop CRADs/lines of inquiry for the MSA.”

1. Are the safety functions for the TSRs’ SACs complete and correct from an Operations perspective?
 - a. Do safety functions provide a top level statement that expresses the objective of the SAC?
 - b. Do the safety functions make clear what is being controlled?
 - c. Does the safety function appropriately identify a specific accident or general rationale for which the SAC is defined?

2. Are the functional requirements for the TSRs’ SACs complete and correct from an Operations perspective?
 - a. Do the functional requirements state what requirements are specifically necessary, if any, to allow the function to be performed?
 - b. Do the functional requirements provided, if any, appear to be sufficient for implementation?

3. Are the safety functions and functional requirements appropriately distinct, or is additional clarification necessary from an Operations Perspective?

At the conclusion of the reference review, the reviewers shall identify:

- (1) any Findings,
- (2) any SAC safety functions or functional requirements that should be revised,
- (3) any proposed recommendations for said revisions based on an Operations perspective.

Any findings and associated potential DSA revisions are identified as either “Routine” or “Priority.” Routine findings can be addressed in the next annual update. Priority findings should be addressed as soon as practicable. Both Routine and Priority findings are categorized according to the terms defined in PRO-00##.

IV. Schedule

The start date is [date]. Per PRO-0052, the Assessment Team will conduct an “...entrance meeting as required with affected organization/facility owners (include Assessment Response Owner).” A final report will be issued by [date]. Per PRO-00##, the review team

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will conduct an exit meeting as required with affected line management, organization, facility owners, and the Assessment Response Owner.

V. Team

This is a joint assessment between Nuclear Operations and the [facilities'] Program. The Assessment Team Leader (Safety Basis Division Leader), Safety Basis Deputy Division Leader, the Safety Basis Division Institutional Reviewer of [facilities], the [facilities'] Program Assurance Manager, [facilities'] Operations personnel, and the Facilities Operations Manager will conduct the review. The Assessment Team has the skills, knowledge, and abilities (SKAs) necessary to evaluate compliance to the specified requirements. The Safety Basis Division Leader and Safety Basis Deputy Division Leader have supported the development of documents such as DOE-STD-3009, DOE-STD-1189, DOE-HDBK-3010-94, and the DOE TSR Guide. The Safety Basis Deputy Division Leader was formerly the Alternate Facility Manager for B251, the Heavy Element Facility.

In accordance with PRO-00##, the Management Self-Assessment Team Leader (Safety Basis Division Leader) and the Safety Basis Deputy Division Leader completed the required training (###). Team members/individual assessors meet training and qualification requirements determined by the manager (NucOps FAM) authorizing the MSA. The other team members reviewed PRO-00## (Ref. ###) and demonstrated their understanding of the process to the selecting manager.