ELECTRIC POWER RESEARCH INSTITUTE

Nuclear Maintenance Applications Center: Guidelines for Addressing Contingency Spare Parts at Nuclear Power Plants

Technical Report

Nuclear Maintenance Applications Center: Guidelines for Addressing Contingency Spare Parts at Nuclear Power Plants

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REPORT SUMMARY

Background

When preparing maintenance work activities, work planners must determine, for each work package, which and how many spare or replacement parts are needed to accomplish the work. In some cases, the parts are on hand in inventory; in other cases, the parts must be made available through procurement processes. In addition, the planner must determine the appropriate number and type of parts needed for contingencies that might arise during the planned maintenance activities. It is often difficult for a work planner to 1) assess the risk associated with not having contingency parts available and 2) "roll up" or group multiple work order material demands to evaluate the overlap of like material quantities. As a result, more parts are typically procured and made available than are actually needed. Without an adequate way to optimize and communicate parts demands (actual and contingency) in a timely manner, errors occur in the types and quantities of items procured. Subsequently, planners conservatively order contingency parts that result in constant inventory growth and overload the procurement process, thereby reducing the effectiveness of material procurement and ultimately affecting work execution.

In 2005, EPRI's Nuclear Maintenance Applications Center (NMAC) published technical report 1011903, *Maintenance Work Package Planning Guidance*. That report provides guidance to power plant personnel regarding work package content as a supplement to INPO document AP-928, Appendix F, "Graded Approach to Planning." The report provides a consistent approach for administrative control, achieving an appropriate level of detail and ensuring an acceptable level of use, work package format, and application. However, the issue of contingency spare or replacement parts is not addressed in detail; therefore, members of the NMAC Steering Committee advised that additional guidance be developed in 2006.

Objectives

- To provide work planning personnel with a generic process and implementation guidance for the determination of contingency spare or replacement parts in support of maintenance activities typically performed during refueling outages
- To enhance the interface between work planning personnel—who are generally responsible for the identification of parts needs—and the supply chain organization—which is responsible for ensuring that material needs are met

Approach

A Technical Advisory Group was formed that consisted of licensee representatives from EPRI NMAC utility members. Input was solicited regarding current practices for identifying parts demands and how each licensee's respective supply chain organization ensured that those demands were met. To address both the supply and demand sides of the issue, expertise was provided from utility representatives of materials, procurement, maintenance, and work planning organizations. Experience-proven practices and techniques were identified during this effort and are compiled in this report.

Results

This report provides an overview of the process for identifying parts needs and supplemental guidance on how licensees can enter and group parts requirements into their respective materials information systems. The report also offers guidance on how contingency parts demand-versus-availability analysis should be conducted as well as process measures that licensees may consider when they implement the guidance.

EPRI Perspective

The information contained in this report represents a significant collection of human performance information, including techniques and good practices, related to the identification and supply of spare or replacement parts in support of common work activities at a nuclear power plant. This compiled information provides a single point of reference for plant work planning and supply chain personnel. Through the use of this report in close conjunction with the industry guidance provided by the Institute of Nuclear Power Operations (INPO), EPRI members should be able to significantly improve and consistently implement the processes associated with identifying contingency spare parts and making them available when they are needed. This will subsequently help members to achieve increased reliability and availability of the components on which work activities are performed.

Keywords

Contingency
Demand
Inventory
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Supply chain
Work planning

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EXECUTIVE SUMMARY

This report provides work planning personnel with a generic process and implementation guidance for determining contingency spare or replacement parts in support of maintenance activities typically performed during refueling outages. It also enhances the interface between work planning personnel—who are generally responsible for identifying parts needs—and the supply chain organization—which is responsible for ensuring that material needs are met.

When preparing maintenance work activities, work planners must determine, for each work package, which and how many spare or replacement parts are needed to accomplish the work. In some cases, the parts are in inventory; in other cases, the parts must be made available through procurement processes. In addition, the planner must determine the appropriate number and type of parts needed for contingencies that might arise during the planned maintenance activities. It is often difficult for a work planner to 1) assess the risk associated with not having contingency parts available and 2) "roll up" or group multiple work order material demands to evaluate the overlap of like material quantities. As a result, more parts are typically procured and made available than are actually needed. Without an adequate way to optimize and communicate parts demands (actual and contingency) in a timely manner, errors occur in the types and quantities of items procured. Subsequently, planners conservatively order contingency parts that result in constant inventory growth and overload the procurement process, thereby reducing the effectiveness of material procurement and ultimately affecting work execution.

The challenge that faces the work planner is determining the certainty with which each part is needed to perform the maintenance activity. For the purposes of this report, a simplified approach is recommended. This approach categorizes, or sorts, parts demand into one of two categories: required or contingency. These terms are defined as follows:

Required part: A part having a high certainty of being needed to complete the defined scope of work

Contingency part: A part that is not needed to complete the defined scope of work but may be needed if the defined work scope increases or changes

A part identified as required is sometimes referred to as one that results in a "hard reserve." This is because the work planner and other organizations contributing to the decision have a high level of certainty that it will be needed; as a result, the supply chain should ensure that the item is available when needed. This report highly recommends that the work planner seek input from several organizations within the utility—and possibly the manufacturer—when making the initial determination of required and contingency parts demands.

The final and most important step in the needs analysis and parts identification process is to assess the risk of categorizing a part as a contingency part instead of categorizing it as a required part. This is important because it provides a method of grading the impact of not having each contingency part if it is needed later. Contingency parts that are less than the established cost threshold should be screened out of any further engineering or risk assessment and be made available as if they were known to be required.

The team of personnel noted previously should use the following simple process for assessing risk:

$$\text{Risk} = \text{probability} \times \text{consequences}$$

The risk does not need to be quantified because one would typically perform a probabilistic risk assessment, but it should consider the qualitative factors that are described next.

After the demands are determined, this report provides guidance on how to enter and group parts requirements into the licensee's materials management information system. This process is commonly referred to as a *rollup*, and the primary method of rolling up parts needs data is to add up the parts needs of all the work orders presented. Many materials management information systems have the capability to add or compile parts demand data by stock code or catalog identification (CAT-ID) after they are entered into the work order. The key to the summation process is to first distinguish on the work order the required parts from the contingency parts. The rollup can then be performed electronically—in many cases—by grouping parts demand by any of the following:

- Manufacturer's part number
- Utility-unique stock code (such as CAT-ID or stock number)
- Other part identification code (such as Universal Product Code or bar code)

Consistent with the Institute of Nuclear Power Operations (INPO) AP-908, this report provides guidance on analyzing the aggregate demand for contingency parts, refining those needs, and assessing the availability of the contingency parts identified. With regard to parts used during maintenance activities, the following would describe an ideal situation:

- No contingency parts were required for each maintenance activity.
- Every part that was required was available.
- Every part that was required was procured at the least cost to the licensee.
- No parts were procured, stored, or issued to the field unnecessarily.

However, given some level of uncertainty that surrounds parts required for each maintenance activity and the level of risk that the licensee deems acceptable regarding the availability of parts, the ideal situation is almost never achievable. The licensee should establish the methods and capture data points that trend how well it identifies and subsequently meets material needs.

In most cases, the supply chain organization should have a method of measuring how effectively material needs are being met. In addition, the work planning or maintenance organization should have methods to measure how accurately material demands were established and communicated to the supply chain organization. Both organizations (that is, the supply side and the demand side) should be accountable to some extent regarding their respective roles and responsibilities in the overall process for material usage and supply.

This report provides performance measurement options, including metrics and data points, as a way to measure the effectiveness of the material demand identification process and, subsequently, the supply and availability of those items. One way of measuring the effectiveness of identifying and meeting contingency material demands is with a supply-versus-demand matrix for contingency parts. Each of the four quadrants of the contingency demand matrix represents one of the four respective scenarios:

- C1: The contingency part was needed and was available. In this outcome, although determined to be a contingency item, the part was, in fact, required for the job. Adjustments should be considered for future work to identify this as a required part instead of a contingency part. The licensee should continue to ensure that these items are available to support the given scope of work.
- C2: The contingency part was **not** needed and was available. In this outcome, the contingency part determination was correct because it was, in fact, not required for the given scope of work. It was available, however, just in case it was needed. Had the part been procured specifically to support this work, the licensee should ensure that future procurements are postponed until either a required need is determined or the stocking level reaches its minimum threshold.
- C3: The contingency part was needed and was **not** available. In this outcome, although determined to be a contingency item, the part was, in fact, required for the job and was not available. Adjustments should be considered for future work to identify this as a required part instead of a contingency part. In addition, regardless of whether the item is considered contingency or required, the licensee should ensure that these items are available to support the given scope of work.
- C4: The contingency part was **not** needed and was **not** available. In this outcome, the contingency part determination was correct because it was, in fact, **not** required for the given scope of work. The licensee's decision to not make the item available also proved to be correct.

Similarly, a way to measure the effectiveness of identifying and meeting required material demands is with a supply-versus-demand matrix for required parts. Each of the four quadrants of the required demand matrix represents one of the four respective scenarios:

- R1: The required part was needed and was available. In this outcome, the required part determination was correct because it was, in fact, required for the job. The supply chain also ensured that the item was available when needed.
- R2: The required part was **not** needed and was available. In this outcome, the part determination was incorrect because it was, in fact, **not** required for the given scope of work. It was available, however, just in case it was needed. Adjustments should be considered for future work to identify this as a contingency part instead of a required part. Had the part been procured specifically to support this work, the licensee should ensure that future procurements are postponed until either a required need is determined or the stocking level reaches its minimum threshold.
- R3: The required part was needed and was **not** available. In this outcome, the required part determination was correct because it was, in fact, required for the job, but it was not available. The licensee supply chain organizations should ensure that these items are available to support the given scope of work.
- R4: The required part was **not** needed and was **not** available. In this outcome, the required part determination was incorrect because it was not required for the given scope of work. Adjustments should be considered for future work to identify this as a contingency part instead of a required part. The licensee’s decision to not make the item available had no adverse impact because the part was not needed. Had the item been required, an outcome similar to R3 would have resulted.

In summary, this report provides guidance that is structured around a generic process for addressing contingency spare parts. The process as described can be broken down into the following four steps (that is, process elements):

1. Identify parts needs.
2. Compile an aggregate demand for parts.
3. Analyze the aggregate needs, and assess part availability.
4. Measure the effectiveness of the process.

The first three steps of the process involve the demand for parts. These three steps are critical because the final determination of how contingency spares will be made available depends on the proper identification, summation, and analysis of parts demand that distinguishes between required and contingency parts.

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1 INTRODUCTION

1.1 Purpose

This report provides work planning personnel with a generic process and implementation guidance for determining contingency spare or replacement parts in support of maintenance activities typically performed during refueling outages. A secondary purpose of this report is to enhance the interface between work planning personnel—who are generally responsible for identifying parts needs—and the supply chain organization—which is responsible for ensuring that material needs are met.

1.2 Background

When preparing maintenance work activities, work planners must determine, for each work package, which and how many spare or replacement parts are needed to accomplish the work. In some cases, the parts are on hand in inventory; in other cases, the parts must be made available through procurement processes. In addition, the planner must determine the appropriate number and type of parts needed for contingencies that might arise during the conduct of the planned maintenance activities. It is often difficult for a work planner to 1) assess the risk associated with not having contingency parts available and 2) "roll up" or group multiple work order material demands to evaluate the overlap of like material quantities. As a result, more parts are typically procured and made available than are actually needed. Without an adequate way to optimize and communicate parts demands (actual and contingency) in a timely manner, errors occur in the types and quantities of items procured. Subsequently, planners conservatively order contingency parts that result in constant inventory growth and overload the procurement process, thereby reducing the effectiveness of material procurement and ultimately affecting work execution.

In 2005, Electric Power Research Institute's Nuclear Maintenance Applications Center (NMAC) published technical report 1011903, *Maintenance Work Package Planning Guidance*. That report provides guidance to power plant personnel regarding work package content as a supplement to INPO document AP-928, Appendix F, "Graded Approach to Planning." The report provides a consistent approach for administrative control, achieving an appropriate level of detail and ensuring an acceptable level of use, work package format, and application. However, the issue of contingency spare or replacement parts is not addressed in detail; therefore, members of the NMAC Steering Committee advised that additional guidance be developed in 2006.

Utility or senior plant management occasionally mandates that a full complement of spare parts should be available prior to disassembly of certain equipment. In essence, a contingency parts risk assessment is mandated to take zero contingency parts risk. Although this approach may be appropriate for some equipment, certainly a contingency parts risk assessment by knowledgeable subject matter experts (SMEs) is a more effective approach for the majority of work tasks.

1.3 Report Structure and Content Overview

Figure 1-1 illustrates the general structure and content of this report. The figure identifies key sections in the report that provide guidance to owners to effectively address contingency spare parts issues during the work planning process.

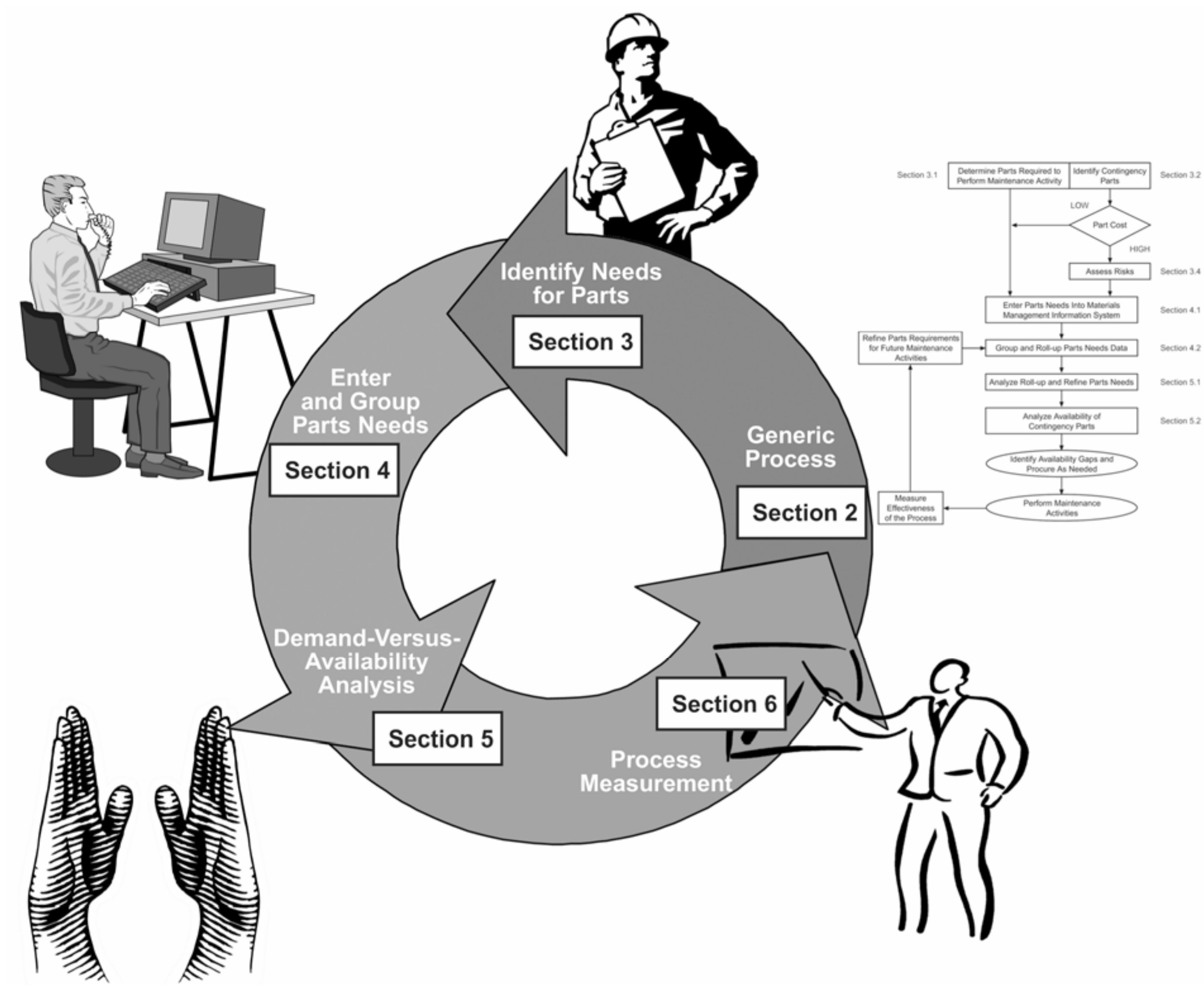

Figure 1-1
Scope and Content of This Report

This section provides an introduction to the report, and Section 2 presents an overview of the generic process and a cross-reference to the other sections in the report. The process for identifying parts needs is provided in Section 3, and Section 4 offers guidance on how to enter and group parts requirements. A contingency parts demand-versus-availability analysis is described in Section 5. Section 6 of the report provides a number of process measures that licensees may consider upon implementation of the guidance, and a complete list of references used during the development of this report is provided in Section 7. Appendix A presents a work planner checklist, and Appendix B provides information on reviewing demand and usage against the stocking plan. Finally, Appendix C contains a listing of the key points in the report.

Each licensee is responsible for complying with regulatory requirements for work package content and quality (including the identification of required and contingency parts) and for determining the most effective method of developing work packages that integrates with other related licensee-specific processes. The recommendations in this report can be used in their entirety or in part, as appropriate, given the other related processes.

1.4 Glossary of Terms and Acronyms

1.4.1 Industry Definitions and Nomenclature

Approved suppliers list (ASL) (approved supplier list, qualified suppliers list, evaluated supplier list). A formal list of those suppliers that have been evaluated and deemed capable of satisfactory performance (Ref. Institute of Nuclear Power Operations [INPO] AP-908 Rev. 3).

Back order. Items ordered that could not be shipped due to a stock out (Ref. INPO AP-908 Rev. 3).

Bid. In purchasing, a bid is an offer to sell or an offer to buy. A bid can be referred to as a proposal or a quotation (Ref. INPO AP-908 Rev. 3).

Bill of materials (BOM). A list containing the quantity and description of all materials required to construct a component (Ref. INPO AP-908 Rev. 3).

Blanket order (blanket purchase order). A term commitment (usually one year or more) to a supplier for certain goods or services over a predetermined time. This practice is aimed at reducing the number of small orders (Ref. INPO AP-908 Rev. 3).

Buyer. A professional buying specialist, typically specialized in a given group of materials or commodities, who is responsible for market analysis, purchase planning, coordination with key users, supplier qualification and selection, order placement, and follow-up activities (Ref. INPO AP-908 Rev. 3).

Carrying cost (inventory holding cost). The cost of keeping inventory on hand, including the opportunity cost of invested funds; storage and handling costs; and taxes, insurance, shrinkage, and obsolescence-risk costs. Firms usually state an item’s holding cost per time period as a percentage of the item's value, typically between 20 and 40 percent per year (Ref. INPO AP-908 Rev. 3).

Commercial grade dedication (CGD). An acceptance process undertaken to provide reasonable assurance that a commercial grade item (CGI) to be used as a basic component will perform its intended safety function and, in this respect, is deemed equivalent to an item designed and manufactured under a 10CFR50 Appendix B quality assurance program (Ref. INPO AP-908 Rev. 3).

Competitive bidding. A common method of source selection; the offer of prices and specified elements of performance by firms competing for a contract (Ref. INPO AP-908 Rev. 3).

Consignment material. A method of stocking inventory in which a supplier maintains inventory on the premises of the purchaser. A purchaser's obligation to pay for the goods begins when goods are drawn from the stock for use. This is also known as supplier-owned inventory (Ref. INPO AP-908 Rev. 3).

Contingency material. Material that may not be needed to support work. The material request must flag the request as contingent, and the supply chain organization must provide work management with the material availability and lead time to make a decision on whether to procure the material (Ref. INPO AP-908 Rev. 3).

Contingency part. A part that is not needed to complete the defined scope of work but may be needed if the defined work scope increases or changes.

Corrective maintenance. The classification of any work on power block systems, structures, or components (SSCs) in which the SSC has failed or is significantly degraded to the point that failure is imminent (within its operating cycle/preventive maintenance [PM] interval) and no longer conforms to or is incapable of performing its design function (Ref. INPO AP-928 Rev. 1).

Critical component. A component that has been evaluated and subsequently categorized as critical through the implementation of INPO AP-913.

Critical spare. A spare part deemed essential to support the maintenance philosophy developed for a critical component according to AP-913 (Ref. INPO AP-908 Rev. 3).

Demand. A request for material from various sources such as requisition on stores, warehouse counter request, and automated system generated reorder request (Ref. INPO AP-908 Rev. 3).

Demand management. The function of recognizing all demands for goods and services to support the marketplace. It involves doing what is required to help make the demand happen and prioritizing demand when supply is lacking. Proper management facilitates the planning and use of resources for profitable business results. Demand management encompasses the activities of forecasting, order entry, order promising, and determining branch warehouse requirements, interplant orders, and service parts requirements (Ref. INPO AP-908 Rev. 3).

Disposition. Final action following the decision on the use of material (for example, recycle, salvage, sell through investment recovery, and repair/refurbish) (Ref. INPO AP-908 Rev. 3).

Elective maintenance. The classification of any work on power block equipment in which identified potential or actual degradation is minor and does not threaten the component's design function or performance criteria (Ref. INPO AP-928 Rev. 1).

Essential spare. An item that is part of a plant component or system whose failure can result in limiting power generation. A limitation on power generation means a loss in the ability to start or operate at full power that does not meet the definition of a critical spare (for example, electrohydraulic control, switchyard, turbine, generator, and cooling) (Ref. INPO AP-908 Rev. 3).

Expedite. The act of contracting a supplier or carrier with the goal of speeding up the delivery date of an inbound shipment (Ref. INPO AP-908 Rev. 3).

Facilities. SSCs not associated with power generation. Structures may include training facilities, warehouses, maintenance shops, and administrative offices. Systems may include fire protection, plumbing, lighting, sewer, and drainage.

Fill rate. The proportion of all stock requisitions that are filled from stock that is present on the shelf. The inverse of this is stock-out rate, which is the percentage of orders for which there is no stock on the shelves and, therefore, the order can not be filled (resulting in a backorder). These measurements can be calculated for any time period; in some retail or distribution firms, it might be computed daily or weekly (Ref. INPO AP-908 Rev. 3).

Functional classification. An item's functional classification is either safety-related (SR) or non-safety-related (NSR) as described in the following:

- SR item. A plant SSC or part thereof necessary to ensure one of the following:
  - The integrity of the reactor coolant pressure boundary
  - The capability to shut down the reactor and maintain it in a safe shutdown condition
  - The capability to prevent or mitigate the consequences of accidents that could result in potential off-site radiation exposures comparable to those described in 10CFR100.11, Determination of Exclusion Area Low Population Zone and Population Center Distance
- NSR item. An item that does not perform an SR function (Ref. EPRI report NP-6406).

Independent verification (IV). A series of actions by two individuals working independently to confirm the condition of a component after the original act that placed the component in that condition (Ref. INPO AP-931).

Inspection. Examination, observation, or measurement to determine the conformance of materials, supplies, components, and parts to the purchase order requirements (Ref. INPO AP-908 Rev. 3).

Inventory control. The effective management of inventories, including decisions about which items to stock at each location, how much stock to keep on hand at various levels of operation, when to buy, how much to buy, controlling pilferage and damage, and managing shortages and backorders (Ref. INPO AP-908 Rev. 3).

Inventory turnover. A measure of the velocity of total inventory movement through the firm, found by dividing annual sales (at cost) by the average aggregate inventory value maintained during the year. Many firms calculate production inventory turnover rate as the annual inventory purchase value divided by the average production inventory value (Ref. INPO AP-908 Rev. 3).

Investment recovery. A systematic organizational effort to manage the surplus equipment and material and recovery items/marketing/disposition activities in a manner that recovers as much of the original capital investment as possible (Ref. INPO AP-908 Rev. 3).

Just-in-time (JIT) system. The basic JIT concept is an operation management philosophy whose dual objectives are to reduce waste and to increase productivity. Operationally, JIT minimizes inventory at all levels: materials purchased, transported, and processed “just in time” for their use in a subsequent stage of the operational process. JIT should be considered carefully, and the use of an effective stocking plan is necessary to compensate for the weakness of JIT (Ref. INPO AP-908 Rev. 3).

Lead time. The period of time from the date of a purchase order to the date of delivery of the order (Ref. INPO AP-908 Rev. 3).

Least cost evaluation. An evaluation that determines the most cost-effective method of procurement (Ref. INPO AP-908 Rev. 3).

Materials management. A managerial and organizational approach used to integrate the supply management function in an organization. It involves planning, acquisition, flow, and distribution of product materials from the raw material to the finished product. Activities typically included are procurement, inventory management, receiving, stores and warehousing, in-plant materials handling, production planning and control, traffic, and surplus and salvage (Ref. INPO AP-908 Rev. 3).

Materials requirements planning (MRP). A system application for single-point demand visibility (Ref. INPO AP-908 Rev. 3).

Minimum reorder point. A predetermined inventory level that triggers a need to place an order. This minimum level (considering safety stock) provides inventory to meet anticipated demand during the time it takes to receive the order (Ref. INPO AP-908 Rev. 3).

Non-power block equipment. Equipment, buildings, and structures not essential for power generation. This category of equipment is consistent at most facilities as components categorized as noncritical per INPO AP-913. In most instances, this equipment may also be referred to as *facilities maintenance*, but it is recognized that this distinction may vary among stations.

Obsolescence. Commonly used in the nuclear industry to refer to contradictory conditions: the condition of being out of date, because of development of better or more economical products, methods, processes, machinery, or facilities, resulting in a loss of value or competitive advantage. Items may be available in the market but are no longer needed in a specific application. The condition of no longer being available in the market due to lack of manufacturer support. Items are needed in a specific application but are no longer available or supported by the original manufacturer and are difficult to otherwise procure and qualify (Ref. INPO AP-908 Rev. 3).

- Obsolescence: plant. Plant no longer uses the part due to modifications.
- Obsolescence: supplier. Manufacturer no longer makes the part.
- Obsolete equipment. Items in plant service that are no longer manufactured or supported by the original manufacturer or are otherwise difficult to procure and qualify.

Performance measurement. A management technique for evaluating the performance of a particular function or person (Ref. INPO AP-908 Rev. 3).

Periodic maintenance. “Time-based” PM actions taken to maintain a piece of equipment within design operating conditions and to extend its life (Ref. INPO AP-928 Rev. 1).

Power block equipment. Power block equipment includes all SSCs required for the safe and reliable operation of the station. It includes all SR and balance-of-plant systems and components required for the operation of the station, including radioactive waste processing and storage and switchyard equipment maintained by the station. SSCs required to maintain federal or state regulatory compliance should be included in this grouping. It does not include buildings or structures that support station staff, such as offices or storage structures, or the HVAC and support systems focused only on habitability of those structures. It is recognized that this distinction may vary among stations.

Predictive maintenance. Condition-based PM actions taken to maintain a piece of equipment within design operating conditions and to extend its life. Predictive maintenance involves troubleshooting, inspection, and/or testing to assess the condition of an SSC (Ref. INPO AP-928 Rev. 1).

Preventive maintenance. Preventive maintenance includes predictive (condition-based) and periodic/planned (time-based) actions taken to maintain a piece of equipment within design operating conditions and to extend its life (Ref. INPO AP-928 Rev. 1).

Process. A sequence of behaviors or series of steps designed to produce a product or service; tangible structures established to direct the behavior of individuals in a predictable, repeatable fashion as they perform various tasks (Ref. INPO AP-908 Rev. 3).

Procurement. The typical activities of specifications development, value analysis, supplier market research, negotiation, buying activities, contract administration, and perhaps inventory control, traffic, receiving, and stores (Ref. INPO AP-908 Rev. 3).

Procurement quality level. The level of activities required for each procurement method to obtain qualified items or services for their identified safety classification (Ref. INPO AP-908 Rev. 3).

Purchase order. A written contractual document prepared by a buyer to describe all terms and conditions of a purchase (Ref. INPO AP-908 Rev. 3).

Purchase requisition. A written or computerized request to the purchasing department for the procurement of goods or services from suppliers (Ref. INPO AP-908 Rev. 3).

Purchasing. One of the major business functions of any organization. A purchaser is typically responsible for the acquisition of required materials, services, and equipment (Ref. INPO AP-908 Rev. 3).

Qualified individual. For the purposes of concurrent verification and IV, a person who has been determined by station management to be qualified to perform verification activities. As a minimum, this individual shall be trained in human performance verification techniques.

Qualified suppliers. Suppliers that have been evaluated and qualified and meet specific quality assurance criteria (Ref. INPO AP-908 Rev. 3).

Quality assurance. A management function that includes establishing specifications that can be met by suppliers; using suppliers that have the capability to provide adequate quality within those specifications; using control processes that ensure high-quality products and services; and developing the method for measuring the product, service, and cost performance of suppliers and comparing that performance with requirements (Ref. INPO AP-908 Rev. 3).

Quality control. The quality assurance activity that measures performance and compares it with specification requirements as a basis for controlling output quality levels (Ref. INPO AP-908 Rev. 3).

RAPID: Readily Available Parts Information Directory. An online parts search engine (a product of Scientech, LLC) used by utility personnel to search for parts and equipment within their own company, in affiliated plants, and in suppliers and supplier catalogs (Ref. INPO AP-908 Rev. 3).

Receiving. The function of receiving and processing incoming materials (Ref. INPO AP-908 Rev. 3).

Receiving/receipt inspection. An inspection at the receiving station to determine that the correct quantity and type of material was shipped and to ascertain the general condition of the material with respect to damage. This inspection is different from that of a technical inspection (Ref. INPO AP-908 Rev. 3).

Required part. A part having a high certainty that it is needed to complete the defined scope of work.

Reverse engineering. Process by which the end user of a product elects to make rather than buy the product using required original specifications and equivalent standards of quality. This strategy is commonly used as a cost-saving measure for critical components or in the event that the product is no longer available from the original supplier. It may include the process of disassembling, evaluating, and redesigning a competitor's product for the purpose of manufacturing a product with similar characteristics without violating any of the competitor's proprietary manufacturing technologies (see APICS Dictionary, 9th Edition) (Ref. INPO AP-908 Rev. 3).

Safety related. Of significance or importance because it applies to:

- SSCs designed to perform a nuclear safety function.
- Services to design, purchase, fabricate, handle, ship, store, clean, erect, install, test, operate, maintain, repair, refuel, and modify SSCs that are designed to perform a nuclear safety function (Ref. INPO AP-908 Rev. 3).

Scope of work. A statement or document that describes the service to be provided as well as technical and quality requirements and conditions related to performance of the service (Ref. INPO AP-908 Rev. 3).

Self-check. An attention-management technique an individual uses to focus attention on the appropriate component, to think about the intended action and its expected outcome before performance, and to verify component condition after performance.

Shelf life. The length of time a manufacturer will guarantee the usability of a product during warehouse storage. It is the predetermined period between the date of manufacture and installation (Ref. INPO AP-908 Rev. 3).

Staging. Typically, staging represents material that is selected and kitted by work management job and placed in an alternative location in the warehouse with the material still remaining in inventory. Staging facilitates levelizing workload in the warehouse, walkdown of material by job well in advance of the work, and efficient delivery of material whose warehouse facilities are remote from the plant (Ref. INPO AP-908 Rev. 3).

STAR. Stop, think, act, review (STAR) is a human performance tool that includes distinct thoughts and actions designed to enhance an individual's attention to detail. STAR is an expected, undocumented standard of performance for personnel at all times during their daily work activities. An individual must be 100 percent sure that the action to be taken is correct before manipulating any equipment. The use of STAR self-checks by personnel must be recognizable by any observer at a distance.

Stock level. The desired quantity of stock to be carried (Ref. INPO AP-908 Rev. 3).

Stock out. Occurs when items normally carried in stock are depleted (Ref. INPO AP-908 Rev. 3).

Stocking plan (maintenance philosophy). A guideline/method/policy/process/procedure for adding new items to inventory, identifying unneeded items already in inventory, and establishing stock levels (Ref. INPO AP-908 Rev. 3).

Strategic sourcing. A systematic process that directs purchasing and supply managers to plan, manage, and develop the supply base to accomplish site and company strategic objectives while at the same time managing business risks (Ref. INPO AP-908 Rev. 3).

Subject matter expert (SME). An individual qualified or previously qualified and experienced in performing a particular task. An SME may also be an individual who, by education, training, and/or experience, is recognized as an expert on a particular subject or system (Ref. INPO ACAD 97-014 Rev. 1).

Supplier evaluation. Objective analysis of existing suppliers by evaluating past performance; a preliminary assessment of potential suppliers. Suppliers typically are evaluated on the basis of their technical quality, delivery, service, cost, and management capabilities (Ref. INPO AP-908 Rev. 3).

Supplier-managed inventory. The practice of making suppliers responsible for determining order size and timing, usually based on receipt of inventory data. The inventory is generally located on site but managed by the supplier (Ref. INPO AP-908 Rev. 3).

Supplier-owned inventory. Inventory in which a supplier owns and maintains inventory on the premises of the purchaser; also known as *consignment inventory* (Ref. INPO AP-908 Rev. 3).

Supplier partnership/alliance. A partnership between a purchasing firm and a supply firm that involves mutual commitment over an extended time period, working toward the mutual benefit of both parties by sharing relevant information and the risks and rewards of the relationship. These relationships require a clear understanding of expectations, open communication and information exchange, mutual trust, and a common direction for the future. Such an arrangement is a collaborative business activity that does not involve the formation of a legal partnership (Ref. INPO AP-908 Rev. 3).

Supply chain management. A systems management concept designed to optimize material costs, quality, and service. This is accomplished by consolidating the following operating activities: purchasing, transportation, warehousing, and quality assurance for incoming materials inventory management and internal distribution. These activities normally are combined in a single department, similar to the arrangement under a materials management organization (Ref. INPO AP-908 Rev. 3).

Time and materials contracts. Such contracts typically provide for the acquisition of services on the basis of 1) direct labor hours at specified fixed hourly rates that include wages, overhead, general and administrative expenses, and profit and 2) materials, generally at cost, including (if appropriate) material handling costs (Ref. INPO AP-908 Rev. 3).

Unit of issue. A unit of measurement in which an item is issued from stock (Ref. INPO AP-908 Rev. 3).

Work instruction. Instructions for performance of the work to be accomplished, the level of detail of which depends on the assigned planning level. When applicable, approved procedures may be referenced and may suffice as work instructions.

Work order. A document used to control work and/or testing activities.

Work package. A compilation of documents that includes the work order, work instructions, and any other supporting material (such as drawings, vendor manuals, weld process sheets, operating experience [OE], safety analysis, and permits).

1.4.2 Acronyms and Abbreviations

ALARA	as low as reasonably achievable
ASL	approved suppliers list
BOM	bill of material
CAT-ID	catalog identification
CFR	Code of Federal Regulations
CGD	commercial grade dedication
CGI	commercial grade item
EPRI	Electric Power Research Institute
ER	equipment reliability
FLOC	functional location
HVAC	heating, ventilating, and air conditioning
ID	identification
INPO	Institute of Nuclear Power Operations
IV	independent verification
JIT	just-in-time
LCO	limiting condition for operation

MR	maintenance request
MRP	materials requirements planning
M&TE	measure and test equipment
NMAC	Nuclear Maintenance Applications Center
NSR	non-safety-related
NUMARC	Nuclear Utilities Management Resource Council
O&M	operations and maintenance
OE	operating event(s) or operating experience
OEM	original equipment manufacturer
PM	preventive maintenance
RAPID	Readily Available Parts Information Directory
ROP	reorder point
SME	subject matter expert
SR	safety-related
SSC	system, structure, or component
STAR	stop, think, act, review
TR	technical report
UPC	Universal Product Code

1.5 Relationship with EPRI NMAC and to Other EPRI Reports

The development of this report was made possible through the close working relationship between EPRI NMAC and the member nuclear utility personnel. EPRI NMAC continues to serve as a key resource for maintenance personnel by providing a wide range of products, including technical reports addressing maintenance processes and system/equipment maintenance guidance, with a focus on improving equipment reliability.

During the development of this report, some EPRI products were identified that provide detailed guidance on work planning, materials management, and supply chain management. These existing EPRI reports were primarily used as source material to ensure consistency of applied guidance among users and are listed in Table 1-1.

Table 1-1
EPRI Reports Used As Source Material

Title	EPRI Report Number
Maintenance Work Package Planning Guidance	1011903
Critical Component Identification Process—Licensee Examples: Scoping and Identification of Critical Components in Support of INPO AP-913	1007935
Facilities Maintenance Guide	1009670
Guidance for Developing and Implementing an On-Line Maintenance Strategy	1009708
Guideline for System Monitoring by System Engineers	TR-107668
Guidelines for Optimizing the Engineering Change Process for Nuclear Power Plants: October 1998 Revision	TR-103586-R1
NMAC Post Maintenance Testing Guide, Revision 1	1009709
System and Equipment Troubleshooting Guideline	1003093

1.6 Key Points

Throughout this report, key information is summarized in “Key Points.” Key Points are bold-lettered boxes that succinctly restate information covered in detail in the surrounding text, making the key point easier to locate.

The primary intent of a Key Point is to emphasize information that will allow individuals to take action for the benefit of their plant. The information included in these Key Points was selected by NMAC personnel, consultants, and utility personnel who prepared and reviewed this report.

The Key Points are organized according to three categories: O&M Cost, Technical, and Human Performance. Each category has an identifying icon, as shown, to draw attention to it when quickly reviewing the report.

Key O&M Cost Point

Emphasizes information that will result in reduced purchase, operating, or maintenance costs.

Key Technical Point

Targets information that will lead to improved equipment reliability.

Key Human Performance Point

Denotes information that requires personnel action or consideration in order to prevent injury or damage or ease completion of the task.

Appendix C of this report contains a listing of all Key Points in each category. The listing restates each Key Point and provides a reference to its location in the body of the report. By reviewing this listing, users of this guide can determine if they have taken advantage of key information that the writers of this report believe would benefit their plants.

2 GENERIC PROCESS FOR ADDRESSING CONTINGENCY SPARES

This section provides a generic process for addressing contingency spare parts and presents an overview of guidance from EPRI report 1011903, on which the details in this report are based.

2.1 Generic Process for Addressing Contingency Spares

Figure 2-1 illustrates the generic process for addressing contingency spare parts. The process as described can be broken down into the following four process elements:

1. Identify parts needs.
2. Compile an aggregate demand for parts.
3. Analyze the aggregate needs and assess part availability.
4. Measure the effectiveness of the process.

The figure illustrates that the first three steps of the process involve the demand for parts and will be described in the corresponding Sections 3.1, 3.2, and 3.3. These three steps are critical because the final determination of how contingency spares will be made available depends on the proper identification, summation, and analysis of part demand and distinguishes between required and contingency parts.

The figure also cross-references the reader to the respective section in the report where detailed guidance is provided. In this sense, the process can be thought of as a "roadmap" that lays out a process that can adopted by any licensee through its integration into site-level or fleet-wide procedures.

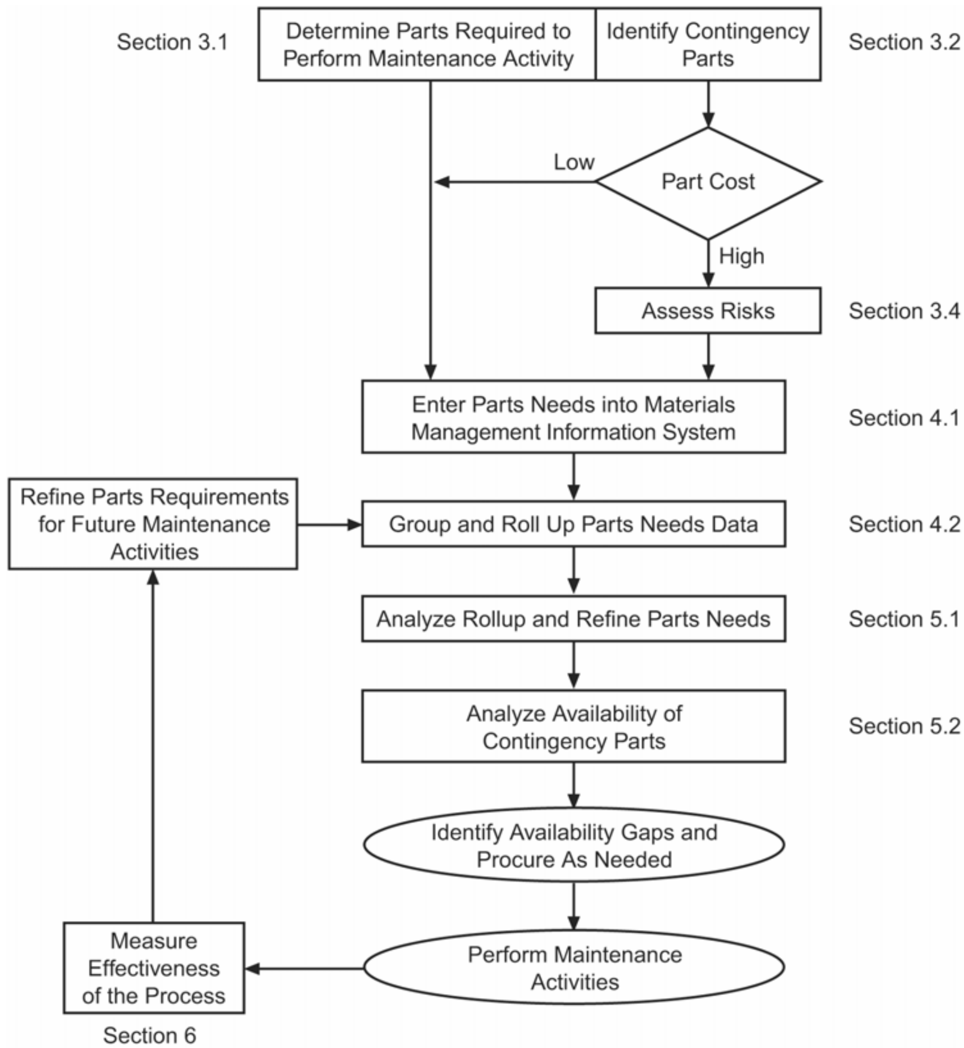

Figure 2-1
Generic Process for Addressing Contingency Spare Parts

Figure 2-2 illustrates a licensee example of a methodology for identifying contingency parts and determining the most cost-effective course of action. Similar to the generic process recommended in this report, the example illustrates that the licensee likewise does the following:

1. Assesses the probability of the part being used
2. Considers the impact or consequences of not having the part available if needed
3. Considers whether the item is already in stock
4. Uses a multifunctional team to challenge the demand(s) prior to taking any procurement actions

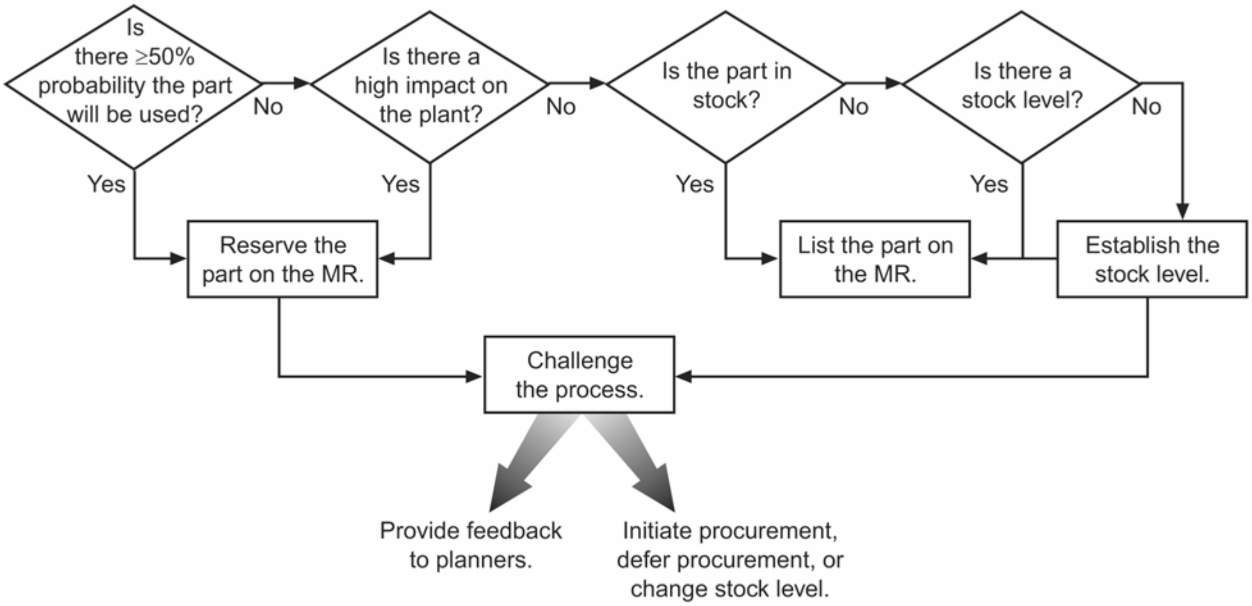

Figure 2-2
Contingency Parts Planning Process
(Courtesy of Progress Energy, Brunswick Plant)

2.2 General Work Planning Guidance on Contingency Spares

Although only in a general sense, the issue of contingency spares is addressed in EPRI report 1011903. Section 3.2.1 lists typical functions of a work planner and states the following (emphasis added):

> Identifying/specifying correct parts and materials to support work package activities, **including identification/coding of contingency material where appropriate**. Ensuring that quality requirements and sufficient quantity are reserved to facilitate repairs or replacements identified in work packages. Identifying and initiating required material/vendor services and preparing applicable procurement and vendor contract requests to ensure cost efficiency in support of maintenance and design change packages for planned outages and online work activities. Supplying procurement engineering with technical field information to ensure that correct parts are procured. Initiating procurement requests for new and obsolete equipment/components.

Section 4.3.2.3 provides the following guidance on the interaction between the work planner and procurement when developing a contingency plan in a work package:

> Planning for contingency parts should also be considered, and if contingency parts are requested, the appropriate supply chain organization(s) should be notified. Specifically, the supply chain should be made aware of their priority, whether the parts need to be staged on-site, and/or whether the maintenance organization needs to know the availability and lead time so alternative procurement arrangements can be explored. The work planner should recognize that contingent material might not be needed to support the planned work activities. However, the material request should still flag the request as

"contingent," and the supply chain organization should provide work management with the material availability and lead time so as to allow a cost-effective decision as to whether to procure and/or expedite the material.

2.3 Overall Keys to Success for Optimizing Parts Availability and Usage

To optimize the processes for identifying parts demand, ensuring parts availability, and maximizing parts usage, close coordination is needed among maintenance, work planning, the supply chain, and site management. As a precursor to the detailed guidance provided in this report, the following programmatic features should be considered key to a successful parts program in support of maintenance work activities:

- Work scope should be defined or known well before the maintenance activity is scheduled to begin. Work scope definition is important on both a task basis (that is, microscopic) and on the larger scale (that is, macroscopic). On the task level (especially during corrective maintenance), inadequate definition of work scope can result in parts being identified as required but not needed when the maintenance activity is performed. On the larger scale, in preparation for a refueling outage, difficulties in freezing the overall work scope in accordance with established milestones can also result in unnecessarily procuring, handling, and storing parts that will not be needed or used.

  The ability to properly define the work scope varies, depending on the type of maintenance activity (that is, preventive versus corrective). Based on operating experience (OE) and prior maintenance activities, work scopes for PM activities tend to be better defined than those for equipment that is inoperable and must be repaired with corrective maintenance activities.

- If the work scope will likely change on initiation of work activity, the planner and SME should assess the risk and probabilities of need in order to jointly determine the cost of either purchasing the items or not.
- The licensee's work management information system should be capable of differentiating among the following:
  - A required part that is already in stock and available
  - A required part that must be procured so that it is available when needed
  - A contingency part that should be already in stock and available
  - A contingency part that must be procured so that it is available if it is needed (see Note)
  - A contingency part that will not be procured (see Note)

  Note: These are the only two options that require a risk and probability assessment as described in this report.

- Site management should determine a dollar limit threshold for the purchase of contingency parts below which negates the need for a documented risk assessment.

3
IDENTIFYING DEMANDS FOR PARTS

This section provides a process for identifying demands for parts in support of maintenance activities. The challenge that faces the work planner is determining the certainty with which each part is needed to perform the maintenance activity. For the purposes of this report, a simplified approach is recommended. This approach categorizes, or sorts, parts demand into one of two categories: required or contingency. These terms are defined as follows:

Required part: A part having a high certainty of being needed to complete the defined scope of work

Contingency part: A part that is not needed to complete the defined scope of work but may be needed if the defined work scope increases or changes

3.1 Overview of the Determination Process for Parts Demand

Figure 3-1 illustrates the method by which the work planner should make the initial determination of parts demand.

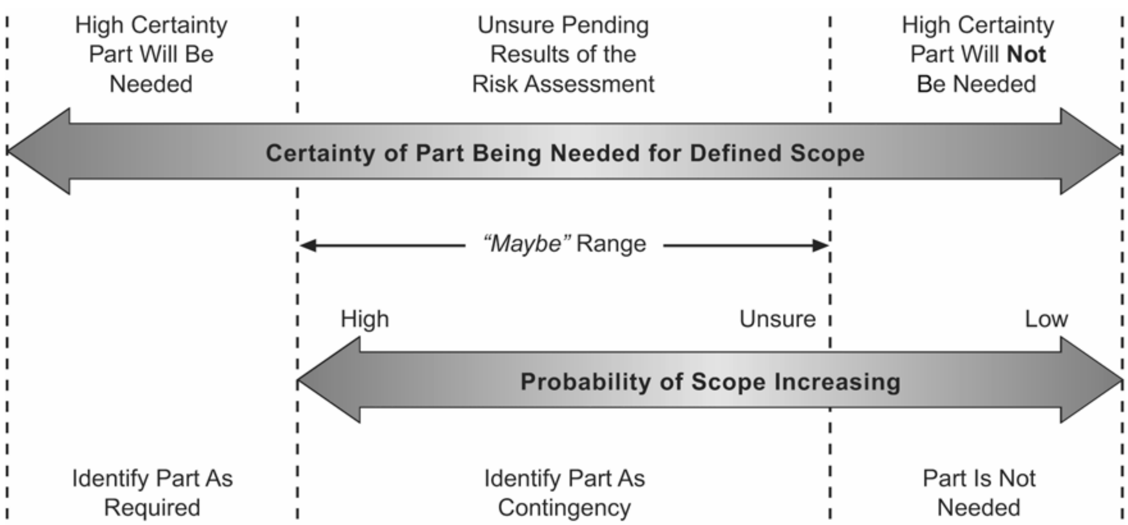

Figure 3-1
Determining Parts Demand

As shown in Figure 3-1 and by definition, a part would be coded “required” if there were a high level of certainty that the part would be needed to complete the defined scope of work. The availability of these required parts is typically ensured because either the part is already in stock or the supply chain initiates a procurement for the needed items.

A part would be coded “contingency” if the planner were uncertain whether the part would be needed for the work scope as defined. A part may also be considered contingency if there were a high probability that the work scope could increase and the part might then be required. The user of this report should recognize that the initial decision and determination of parts demand will vary from one planner to the next because the decision is based on many qualitative factors, including the planner’s own level of conservatism or aversion to risk.

No parts demand would be identified in those cases in which the work planner had high certainty that the part was not required for the defined scope of work and/or there was little or no probability that the work scope would increase and the part might then be required.

Detailed guidance on the identification of both required and contingency parts is provided in Sections 3.2 and 3.3, respectively. Additional guidance on the final determination of parts demand and the risks associated with grading the demand is provided in Section 3.4.

3.2 Identifying Parts Required to Perform Maintenance Activities

Parts coded as required are sometimes referred to as those resulting in a “hard reserve.” This is because the work planner and the other organizations contributing to the decision have a high level of certainty that the part will be needed; as a result, the supply chain should ensure that the part is available when needed.

3.2.1 Organizations That Provide Input to the Decision-Making Process

Figure 3-2 illustrates that, although the work planner is typically responsible for making the determination regarding required parts, input should be sought from and provided by the following organizations when making an initial determination:

- Organizations responsible for providing site/industry OE and corrective actions
- Operations
- Procurement engineering
- System engineering
- Program managers
- Component SMEs
- Work scheduling/management
- Design engineering

- System/component engineering
- Supply chain
- Maintenance
- Original equipment manufacturer

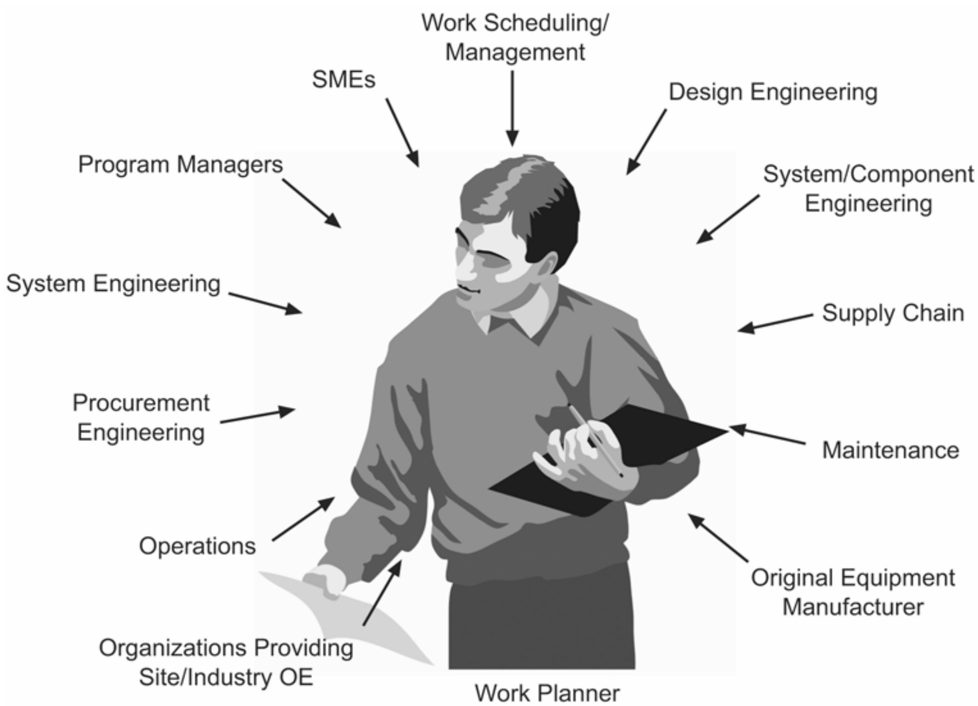

Figure 3-2
Contributors to Determining Parts Demand

3.2.2 Factors That Affect the Determination of Required Parts

To enable work planners to properly identify the required parts, the following aspects of the planning process should be effectively implemented:

- Definition of the work scope
- Access to and review of current work order history
- Access to and review of parts usage history
- Access to a mature and accurate component parts lists (that is, BOM, including part-level information) and/or the ability to build the lists from each work order completed
- Access to and review of accurate drawings and vendor technical manuals
- Understanding the parts planning/reserving process from work planning, maintenance, procurement, and scheduling perspectives
- Maintaining good configuration control

- Design basis requirements of the host component
- Maintenance type or category
- Programs associated with the host component

Appendix A of this report provides a checklist that the work planner can use to assist in the initial determination of required parts for a given scope of work.

3.2.2.1 Work Scope Definition

One of the primary contributors to the accurate and consistent identification of required parts for any maintenance activity is defining the scope of work to be performed. The work planner should be provided with work scopes that enable him/her to accurately determine the required parts. The degree to which a maintenance scope of work is defined may vary depending on whether the maintenance activity is corrective, preventive, or predictive. The specificity of scopes of work for design modifications, surveillances, or troubleshooting activities also tends to vary.

Key O&M Cost Point

The better the scope of work is defined, the more accurately the work planner can estimate the parts required to perform the work

The challenge that many work planners face is estimating parts for poorly defined work scopes. Examples of poorly defined scopes of work follow, and, as such, care should be taken to avoid presenting scopes of work in this manner:

- “Inspect and replace as needed.”
- “Troubleshoot and repair.”
- “Overhaul in accordance with the component manufacturer’s recommendations.”
- “Replace worn or broken parts, if necessary.”

Key O&M Cost Point

When work scopes are poorly defined, a work planner is more likely to identify more required parts than are actually needed and is less able to identify contingency parts.

3.2.2.2 Accessibility of Current Work Order History

Another contributing factor to accurately identifying required parts is the work planner having access to work order and material usage history. The work planner should review the history to identify trends in actual parts usage versus parts needs. Past work orders for similar or identical maintenance activities can provide an indication of the actual parts that were required and how those requirements may be changing over time as the equipment ages.

Key Human Performance Point

When reviewing past work order material usage history, work planners should consider both material that was issued to a work order and material that was returned if not used. Issued material by itself may not be a sufficient method on its own to determine material usage.

The user of this report should recognize that limitations may exist regarding the information system's capability for identifying and tracking parts that were issued but not needed at the work order or component level.

3.2.2.3 Bills of Material

Work planners should have access to mature and accurate component parts lists (that is, BOMs) that include part-level information. The BOM can provide insight into the scope of parts within a given component, their functions, and whether they are needed to perform a particular maintenance activity. This type of information may also be provided through the equipment manufacturer or through the licensee's engineering organization.

In some cases, it may be possible to build the parts lists from each completed work order. In this way, the BOM becomes the database in which part requirements are captured and referenced for future work. Some information management systems (for example, PassPort [a product of Indus International, Inc.]) have the capability to use past parts usage and issues for a given component to develop a parts list.

Key O&M Cost Point

Inadequate and/or incomplete BOMs have a significant impact on an organization's ability to identify, track, and manage contingency parts required for either on-line or outage maintenance activities.

Key O&M Cost Point

Some information management systems (for example, PassPort) have the capability to develop a parts list based on past parts usage/issues for a given component.

3.2.2.4 Drawings, Vendor Technical Manuals, and Configuration Control

Work planners should have access to accurate drawings and vendor technical manuals. In many cases, parts requirements will be described in these documents to support various maintenance work activities. Care should be taken to ensure that the correct drawings are referenced; incorrect or outdated component drawings will result in the incorrect parts being procured and possibly installed.

Key to ensuring that correct and accurate drawings are provided to work planners is proper implementation of the licensee's configuration management program. Additional guidance on configuration control is provided in the EPRI report *Configuration Management* (1010277).

3.2.2.5 Familiarization with Parts Planning/Reserving Process

Work planners and supply chain personnel should fully understand the site's parts planning/reserving process from work planning, maintenance, procurement, and scheduling perspectives. Although administrative in nature, familiarity with this process ensures that planners are aware of source material available at the site, how they should coordinate the parts planning process with interfacing organizations, and how much time should be allotted to ensure that the process is performed effectively. Work planners should thus be properly trained on site-specific procedures regarding how parts are planned, reserved, and/or procured.

Key Technical Point

Supply chain personnel and work planners placing demands on materials must be familiar with the others' processes and policies to ensure that the optimal quantities of materials are procured.

3.2.2.6 Parts Identification Timetables Based on Maintenance Type or Category

Parts required for a given maintenance activity should be identified based on the overall type of work being performed and in accordance with the following guidance:

- On-line maintenance: Identify parts in accordance with the appropriate work week schedule.
- Outage maintenance: Identify parts in accordance with current outage milestones.
- Maintenance supporting a component program: Identify parts in accordance with the overall program plan and schedule.

Knowing the timetable associated with the maintenance activity is important because, in some cases, the final determination regarding the need for a given part will not be revealed until the actual work activities commence. As such, the timetable dictating the potential need for an item weighed against the lead time of procuring it (if it is not already available in stock) will both be key factors that should be considered when the compiled demands are known. Additional guidance on the demand and availability analysis is provided in Section 5 of this report.

3.3 Identifying Contingency Parts

As defined in Section 2 of this report, a contingency part is a part that is not known to be needed to complete the defined scope of work but may be needed if the defined work is uncertain or the defined work scope increases or changes. In some cases, licensees mistakenly refer to these items as those resulting in a "soft reserve" as a way of indicating uncertainty about their availability for the task as defined—instead of focusing on the certainty of the demand. However, this misnomer can lead the work planner to believe that, because these parts are coded as contingency, they will not be available if needed; however, the work planner will be blamed if this occurs.

Key O&M Cost Point

Because a part is identified as contingency should not imply that it will not be available if it is needed.

3.3.1 Organizations That Provide Input to the Decision-Making Process

Maintenance work planners depend on the same organizations as illustrated in Figure 3-2 to effectively perform this aspect of the process, but they should also consider the following factors when making the decision to identify a contingency part:

- Level of conservatism regarding parts availability espoused by senior plant management
- Plant/site maintenance philosophy
- Work planner confidence in the supply chain
- Availability of spare host components or equipment

3.3.1.1 Senior Plant Management Philosophy and Prevailing Culture

Based on past outage experiences and/or OE, the level of conservatism among senior plant managers varies significantly within the industry regarding the availability of parts needed for planned maintenance activities. It can be very difficult to strike a balance between the must-maintain safe and reliable plant operation in a cost-effective manner and the costs associated with having parts available when they are needed. In this sense, the inventory of spare and replacement parts is analogous to an insurance policy. Some senior managers espouse a very conservative policy, taking little or no risk of parts being unavailable if and when they are needed. A policy of this nature can have a significant influence on work planners to identify a larger population of required parts than may be actually needed. However, a "better to be safe than sorry" approach can often result in the following consequences:

- Work planners tend to identify more parts as required and few, if any, parts as contingent.
- Required parts are procured unnecessarily, not used, and subsequently returned. This first overloads the procurement organization and prevents it from prioritizing and focusing on those parts that are actually required. It also precludes the supply chain from optimizing parts availability and being part of the decision regarding how contingency parts should be made available in the most cost-effective manner. Over time, this practice increases the inventory and the costs associated with storing these parts on site.

Key O&M Cost Point

Assistance from organizations other than work planning results in a more accurate determination of parts demand.

Ideally, senior plant management should trust the work planner and support organizations to consistently make the correct decisions when identifying contingency parts and to use the guidance provided in this report to effectively distinguish between required and contingency parts for each planned job.

3.3.1.2 Plant/Site Maintenance Philosophy

The work planner should be aware of the current plant/site maintenance philosophy regarding how corrective maintenance is performed. In many cases, the licensee provides published guidance in this regard to assist work planners. For example, some licensees promote a policy of component replacement in lieu of component repair. In other cases, the licensee may distinguish replacement-versus-repair practices for certain types or sizes of components (for example, valves 2 in. [50.8 mm] and under are replaced in their entirety and not repaired with spare parts). The documentation of this prevailing guidance or philosophy is key when planning corrective maintenance and greatly impacts whether parts will be needed in the first place.

Key O&M Cost Point

Supply chain, maintenance, and work planning personnel should document maintenance philosophies to ensure effective communication and to optimize the materials availability process.

3.3.1.3 Confidence in the Supply Chain

Another factor affecting the work planner's ability or willingness to identify contingency parts is his/her confidence in the supply chain's ability to make the contingency parts available if and when they are needed.

Key O&M Cost Point

Work planners should not assume that designating a part as contingency will result in it not being available or that it will not be procured.

Work planners should not define a contingency part based on its availability. A common misconception in the nuclear industry is that contingency parts are not going to be available but that those designated as required will be made available when needed. Given this misperception, it is not surprising that many work planners default to designating all parts as required and few, if any, as contingency.

Work planners should have confidence in the supply chain that both required and contingency parts will be available to maintenance personnel when they are needed. However, work planners should not accept all of the risk associated with contingency parts being needed and then not available. Rather, they should involve the supply chain organizations in the parts designation decision in the first place and then have confidence that any and all of the identified parts will be available when they are needed to perform the work activities.

3.3.2 Factors That Affect the Determination of Contingency Parts

In addition to the factors described in Section 3.2.2, the following factors should be considered when the work planner identifies contingency parts:

- Cost of the contingency part
- Sharing the knowledge of the component specialist/SME/component or system engineer
- Ability to distinguish between required and contingency parts
- Maintenance history and reliability of the host component or equipment

3.3.2.1 Cost of Contingency Parts

The first factor that should be considered when identifying the need for contingency parts, and subsequently their availability, is the cost of the parts. Site management should establish a threshold cost for items below which the item is screened out of any further engineering/risk assessment and made available as if it were known to be required. Potential expediting costs should also be considered as a contributor to the overall cost of the contingency part.

3.3.2.2 Input of Subject Matter Experts

Another contributing factor to accurately identifying required parts is the work planner being provided technical input from component SMEs. The work planner should solicit their input to identify trends in actual parts usage versus parts needs. The SME may be able to provide an indication of how parts requirements may be changing over time as the equipment ages.

3.3.2.3 Distinguishing Between Required Parts and Contingency Parts

Fundamental to the process of identifying contingency parts is each licensee's information system capability to distinguish between parts needs during the work planning process.

> **Key O&M Cost Point**
>
> Site information systems should be able to distinguish between a required part and a contingency part.

This distinction may be accomplished in a number of different ways, depending on the information system design and format. Examples of how the distinction between required and contingency needs can be identified are provided in Figures 3-3 through 3-6. Figure 3-3 is a screen capture listing eight items associated with a given maintenance activity. Six of the eight are coded "3 Immediately," and two are coded "1 Never." These designations, as defined in the information management system, are used to identify required parts and contingency parts, respectively.

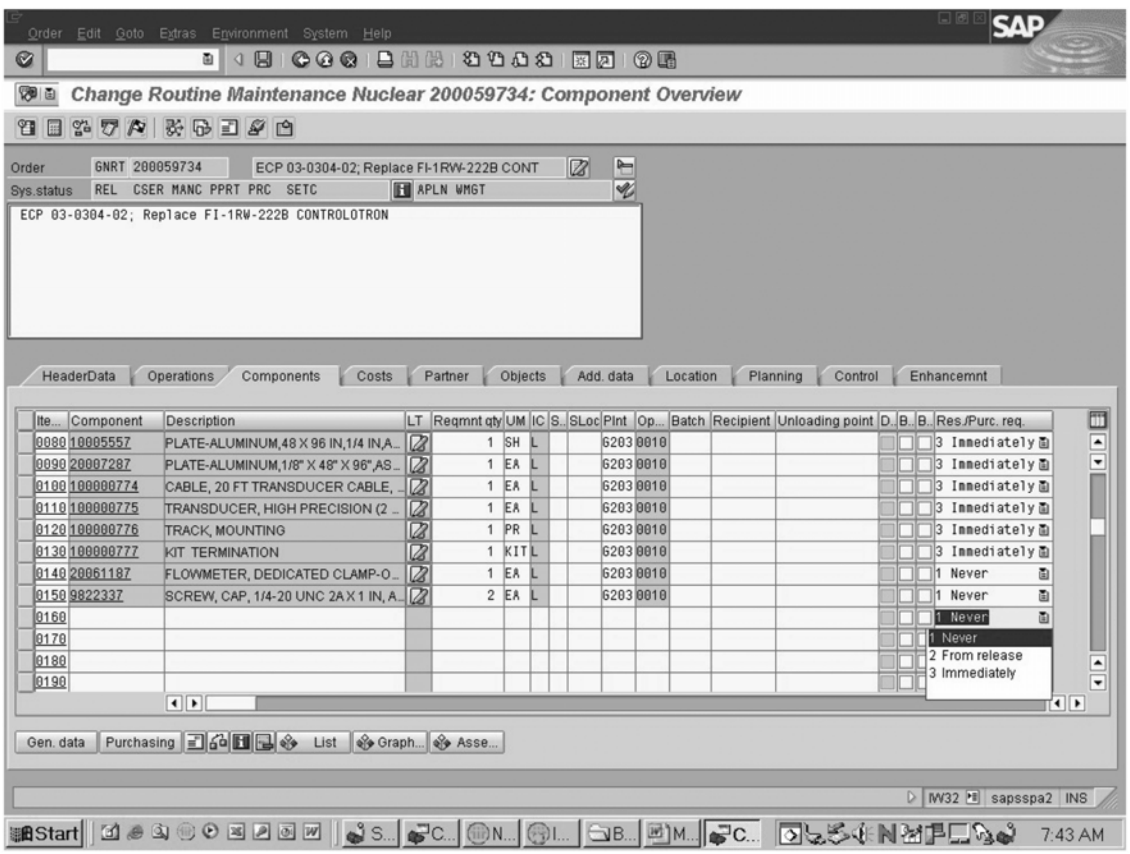

Figure 3-3
Sample Identification of Required and Contingency Parts
(Courtesy of FirstEnergy)

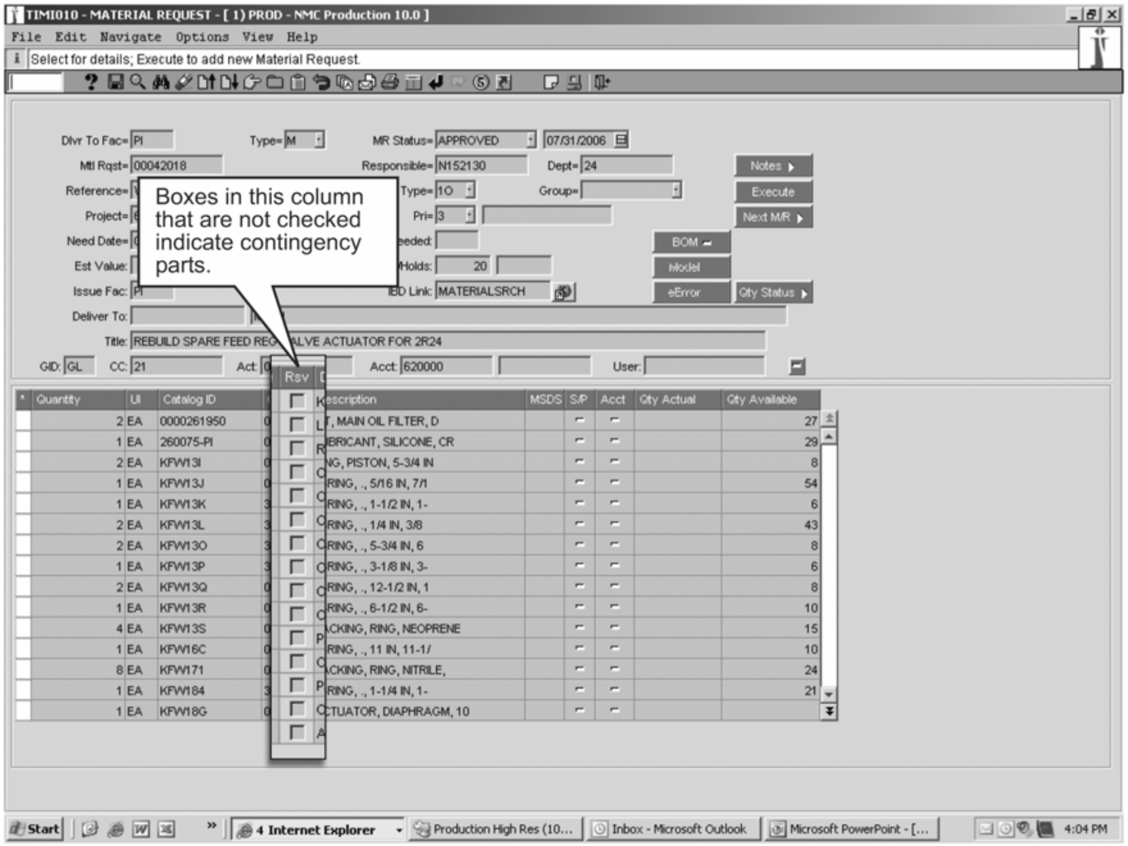

Figure 3-4
Example of Identification of Contingency Parts
(Courtesy of Nuclear Management Company)

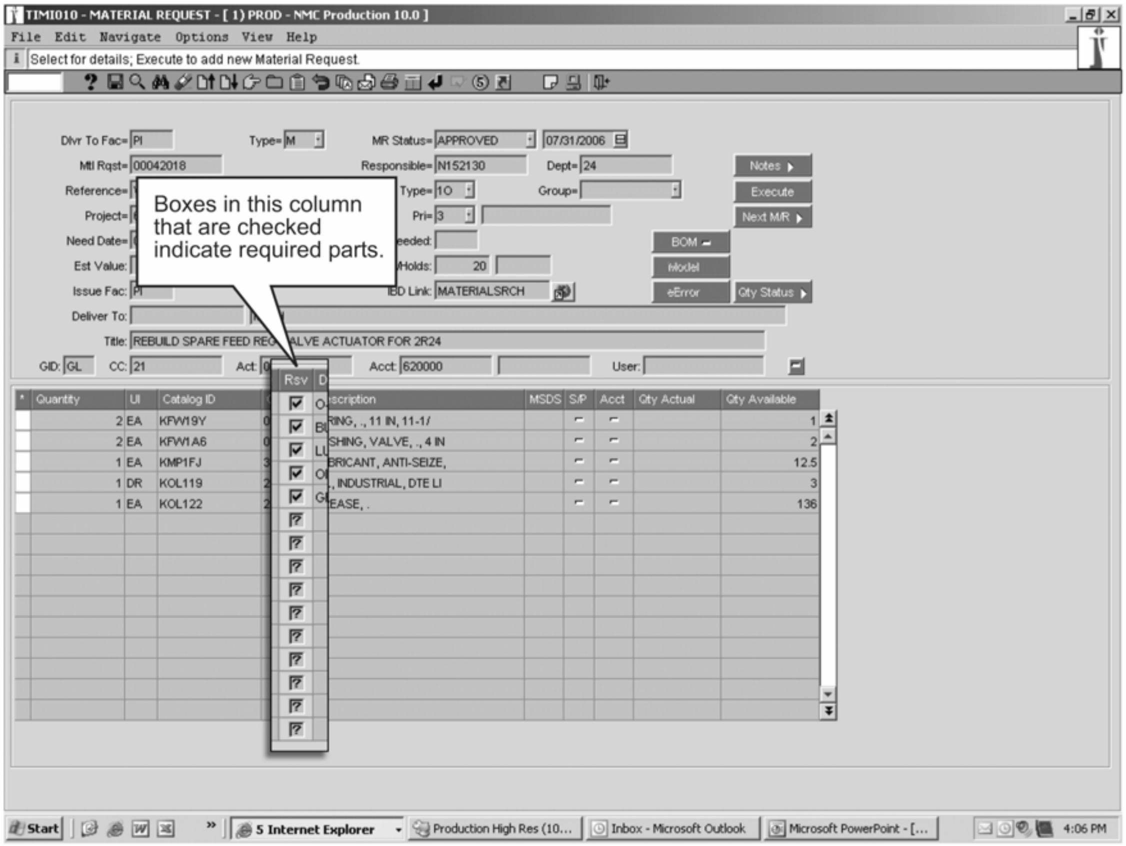

Figure 3-5
Example of Identification of Required Parts
(Courtesy of Nuclear Management Company)

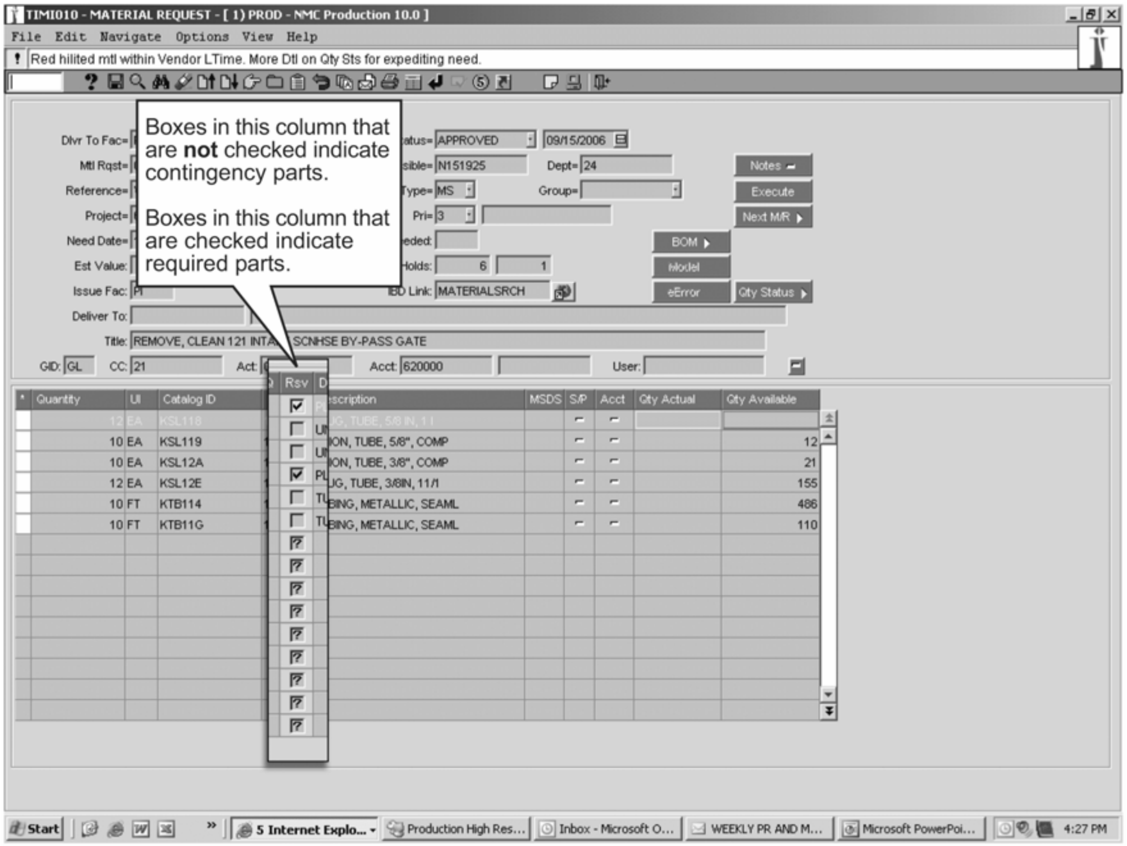

Figure 3-6
Example of Identification of Required and Contingency Parts
(Courtesy of Nuclear Management Company)

3.4 Assessing Risks

The final step in the needs analysis and part identification process is to assess the risk of categorizing a part as contingency rather than as a required part. This is important because it provides a method of grading the impact of not having each contingency part if it is needed later. As noted previously, contingency parts that are below the established cost threshold should screen out of any further engineering/risk assessment and be made available as if they were known to be required.

3.4.1 Team Approach to Assessing Risk

As shown in Figure 3-7, the licensee should consider having a team of individuals perform this risk assessment. The team should include individuals from the same organizations who assisted the work planner in initially identifying parts demand and should consist of the following personnel:

- Work planners
- Procurement engineering
- Design/system/component engineering
- Plant operations
- Maintenance
- Work scheduling/outage management
- Supply chain
- Organizations responsible for providing site/industry OE and corrective action
- Host component/equipment manufacturer

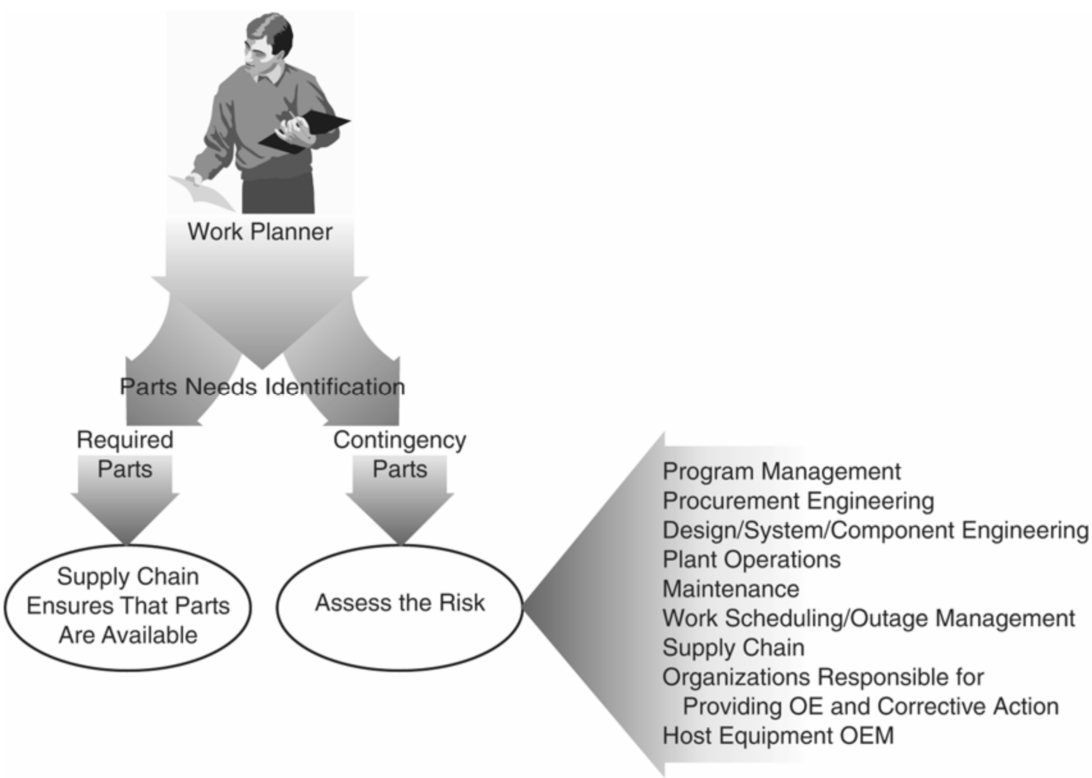

Figure 3-7
Team Approach for Assessing Risk

The figure illustrates that the work planner should be provided input from site organizations regarding the risks associated with the part needs identification process. The risk assessment should not always be performed solely by the work planner. The figure also illustrates that for parts initially identified as required, the supply should dictate procurements for those items if they are not already in stock.

Key O&M Cost Point

Risk assessments for contingency parts that cost more than the predetermined threshold amount should be performed with a team of plant personnel and should be documented.

3.4.2 Process for Assessing Risk

The team of personnel previously noted should use the following simple process for assessing risk:

$$\text{Risk} = \text{probability} \times \text{consequences}$$

The risk need not be quantified because one would typically perform a probabilistic risk assessment, but it should consider a number of qualitative factors that are discussed next.

3.4.2.1 Probability Assessment

The first step in the risk assessment is to identify the probability of needing the item when maintenance activities commence. *Probability* is defined as the likelihood of needing the identified part. The following factors affect this analysis:

- Usage history of the item (issued and installed)
- Whether the host component is critical or essential
- Whether the work will be performed on-line or during an outage
- Plant and industry OE
- Current condition of the equipment
- Age of the equipment
- Equipment performance trends and failure history
- Equipment reliability

Note that many of the factors considered in the initial determination of the parts demand that are provided in Appendix A of this report should also be considered again at this time.

3.4.2.2 Consequences Assessment

The second step in the risk decision is to consider the *consequences*, which are defined as the effect of not having the item if it is needed. The following factors affect this part of the analysis and should be considered before making the decision:

- Impact on technical specifications, limiting condition for operation (LCO) status, and Maintenance Rule compliance
- Impact on plant availability or operating status
- Impact on equipment reliability
- Impact on outage schedule
- Regulatory margin
- Costs associated with perceived impacts (financial, regulatory, and organizational)
- Cost associated with not using the part(s)

3.4.3 Grading the Risk Level

An optional process the licensee may want to consider at this time is developing a way of quantifying or grading the level of risk associated with identifying certain parts as contingency rather than required. The quantification can be based on corporate culture or the amount of risk that management is willing to accept. To simplify the process, the licensee may establish various threshold levels assigned to contingency part risk (that is, Contingency 1, Contingency 2, and so on) and various factors that would predetermine into which risk category the contingency part falls.

For example, if the planner and the team determined that there was a high likelihood that the scope might change—resulting in a 50% certainty that the part would be needed—and the part purchase cost was $240 each, the item might be categorized as a Contingency 1 item. And in their system, items receiving a Contingency 1 category would have to be made available if and when they were actually needed. In another example, if the planner and team determined that there was only a 25% certainty that the item would be needed—and the part purchase cost was $10,000—the item might be categorized as a Contingency 2 item. And in their system, items receiving a Contingency 2 category would not be procured.

The user of this report should recognize that this quantification guidance should be treated as a tool to assist planners and reduce the amount of subjectivity associated with risk assessment probabilities. Typical risk thresholds are depicted for illustrative purposes in Figures 3-8 and 3-9 in the following subsection.

3.4.4 Results of the Risk Assessment

Figures 3-8 and 3-9 illustrate how the risk assessment results may affect the determination of parts demand in general and the identification of contingency parts in particular. Specifically, Figure 3-8 illustrates the initial determination of parts demand prior to the risk assessment being performed. The figure is consistent with Figure 3-7, which depicts the response of the supply chain to the required parts identified by ensuring that they will be made available in all cases.

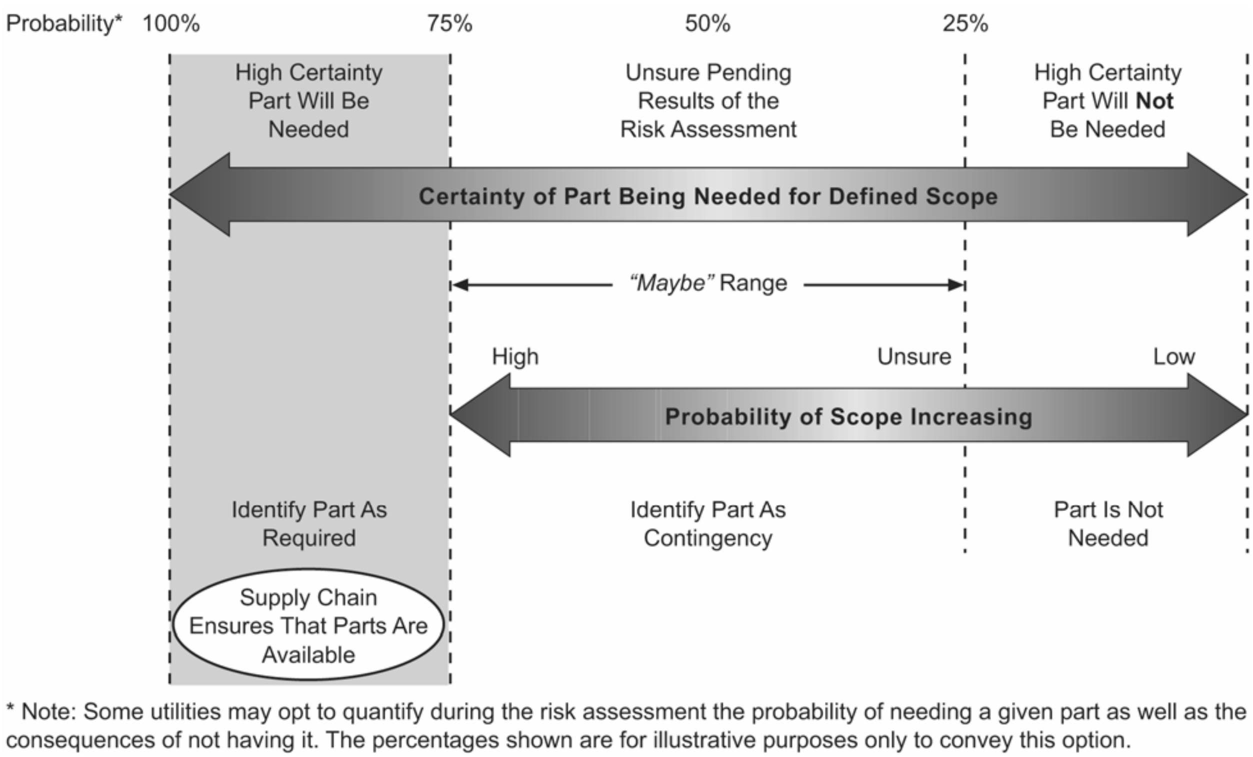

Figure 3-8
Initial Determination of Parts Demand Prior to the Risk Assessment

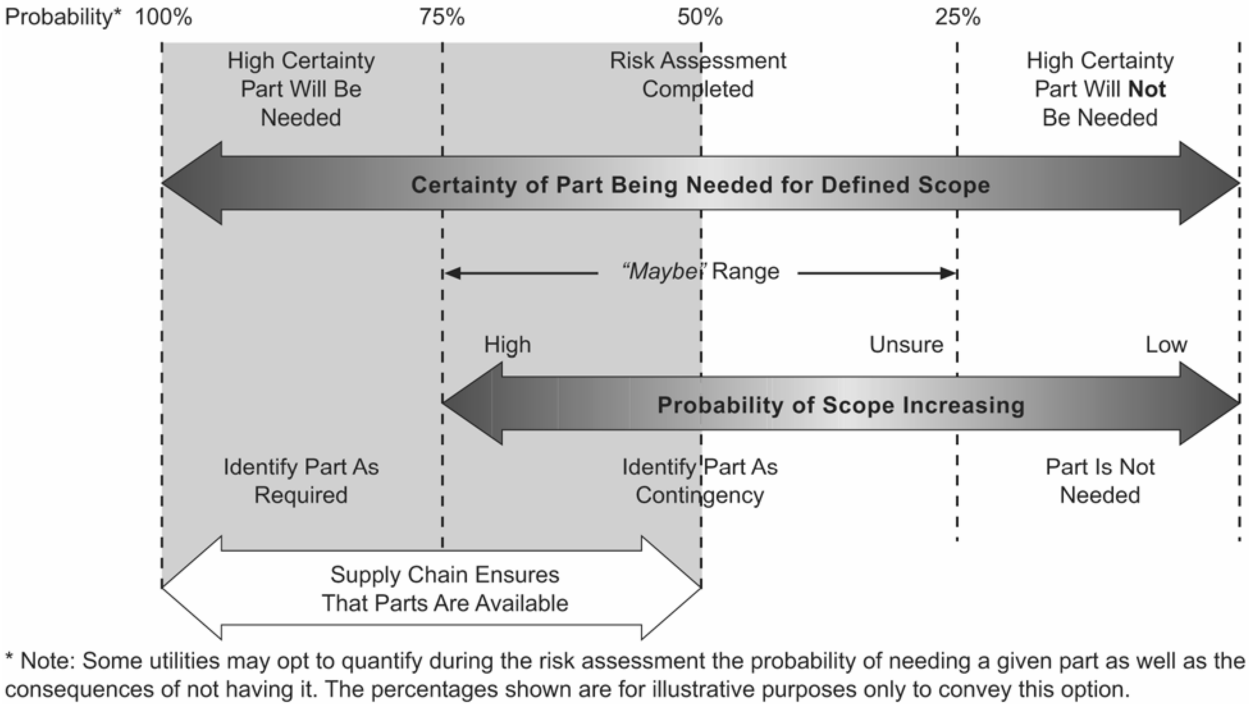

Figure 3-9
Parts Demand After the Risk Assessment

Figure 3-9 illustrates that the risk assessment will most likely increase the number of parts that the team determines should be made available (note that the shaded area on the left has expanded to include some of the contingency parts). Thus, the number of remaining contingency demands for which parts will not be made available will decrease in proportion. If the results of the risk assessment validate the initial determination, the number of contingency demands will remain as initially determined by the work planner.

At this point in the process, the work planner (after receiving input and decision-making guidance from other organizations) should have made an initial determination of parts demand for a given work order or group of similar work orders for which he/she is responsible. This parts demand determination should include both the required and the contingency parts. These results, which are determined at the work order level, should then be grouped or compiled (that is, "rolled up") before a decision is made regarding the level of availability warranted to meet the contingency needs. Section 4 of this report provides guidance on identifying parts demand on an aggregate or "big picture" level rather than on a work order level.

3.4.5 Documenting the Risk Assessment

Table 3-1 provides an example of how the risk assessment may be documented by the team of individuals involved in making the final determination. Note that for the purposes of this example, the cost threshold level that was established was $5,000.

Table 3-1
Example of Contingency Parts Risk Assessment Form
(Courtesy of FPL Corporation)

Contingency Parts Risk Assessment **(for contingency parts >$5,000)**		
Work Order(s) Number(s):		
Overview of Contingency Parts Demand:		
Contingency Parts and Costs		
Part ID	Description	Cost
Comments/Considerations:		
Probability of Needing Part(s) 1 2 3 4 5 Low Moderate Very High 0% 25% 50% 75% 100%		
Consequence of Not Having Part(s) 1 2 3 4 5 Low Moderate Very High		
Risk Assessment Team Members		
Name:	Name:	Name:
Name:	Name:	Name:
Name:	Name:	Name:
Ensure Probability: Date:	YES	NO

4
ENTER AND GROUP PARTS REQUIREMENTS

This section should enable the licensee to identify parts demands on a larger scale (that is, larger than the single work order) by grouping identical demands in order to better assess the total number of parts that are required and those identified as contingent.

4.1 Enter Parts Needs into Materials Management Information System

After completing the risk assessment as described in Section 3.4, the work planner should enter the parts demand determination for each work order into the site's materials management information system. This is often accomplished by coding or identifying the parts as required or contingent on the work order before it is entered electronically into the system.

The work planner should consider allowing the mechanics and/or craft labor to review the parts demand determination at this point, either prior to or in parallel with the process of entering the parts demand into the materials management system.

4.1.1 Introduction

INPO AP-908 recognizes that a demand requirement may enter the supply chain through a number of sources. Materials or services needs may be identified by request, planning inquiry, schedule review, or restocking demand. For the purposes of this report, the method by which required and contingency parts demand most likely will be identified to the supply chain is through the maintenance work order.

4.1.2 Demand Input

INPO AP-908 states that a demand input should be generated through a documented process such as requisitions, reservation, inventory restocks, or systematic inventory analysis. In general, the end users must clearly define their needs to ensure that all requirements are met. The work planner should identify the following information, where applicable, in order to prepare engineering and purchasing requirements and effectively implement the materials and services process prior to the "need date":

- Intended plant application (that is, component use)
- Quantity and date needed
- Funding authorization and limitations

- Sole-/single-source justification in accordance with the site-specific guidelines
- Supplier part number and/or descriptive information
- Recommended supplier and/or manufacturer

4.2 Group and Roll Up Parts Demand Data

The next step in the process is to group work orders and aggregate the demands consistent with the appropriate timeframes. Depending on the organizational structure of the licensee as it prepares for an outage or to conduct on-line maintenance, this subprocess is best coordinated by the work planning and supply chain organizations. The purpose of this step is to elevate the assessment of parts demand from a single work order perspective to a total work scope perspective (for example, grouped, filtered, or sorted into an aggregate demand). This roll-up process is usually effective for outage and work week activities.

4.2.1 Method of Rolling Up Parts Demand Data

The primary method of rolling up parts needs data is to add up the parts needs of all the work orders presented. Many materials management information systems have the capability to add or compile parts demand data by stock code or CAT-ID after they are entered into the work order (that is, create an aggregate demand). The key to the summation process is to first distinguish on the work order the required parts from the contingency parts. The rollup can then be performed electronically—in many cases—by grouping parts demand by any of the following:

- Manufacturer’s part number
- Utility unique stock code (for example, CAT-ID or stock number)
- Other part identification code (for example, Universal Product Code [UPC] or bar code)

Figure 4-1 illustrates the concept of the rollup. In the figure, there are three work orders associated with a given line of similar components. The same work planner did not prepare all of the work orders, however. Not surprisingly, there is a lot of overlap among the work orders and a lot of the same parts have been identified—though some consider the parts required and some contingency.

Work Order #1

Stock Code	Required	Contingency
XC76250	3	
PNC0054	2	
YCH22654		3
CCP5552-3		3
N-743-001		2

Work Order #2

Stock Code	Required	Contingency
A-N-99X	4	
XC76250	3	
MXN-55-70	2	
YCH22654	3	
PNC0054		3
CCP5552-3		3

Work Order #3

Stock Code	Required	Contingency
A-N-99X	4	
NOP-6755	6	
XC76250		2
PNC0057-N		3
CCP5552-3		3
N-743-002		2

Figure 4-1
Work Orders Compiled for Demand Rollups

The rollup will take a given stock code or CAT-ID and total the demand across all of the work orders. This demand should provide a total (by stock code or CAT-ID) of the number of required needs and contingency needs determined for that item. Figure 4-2 illustrates the rollup for two of the stock codes identified.

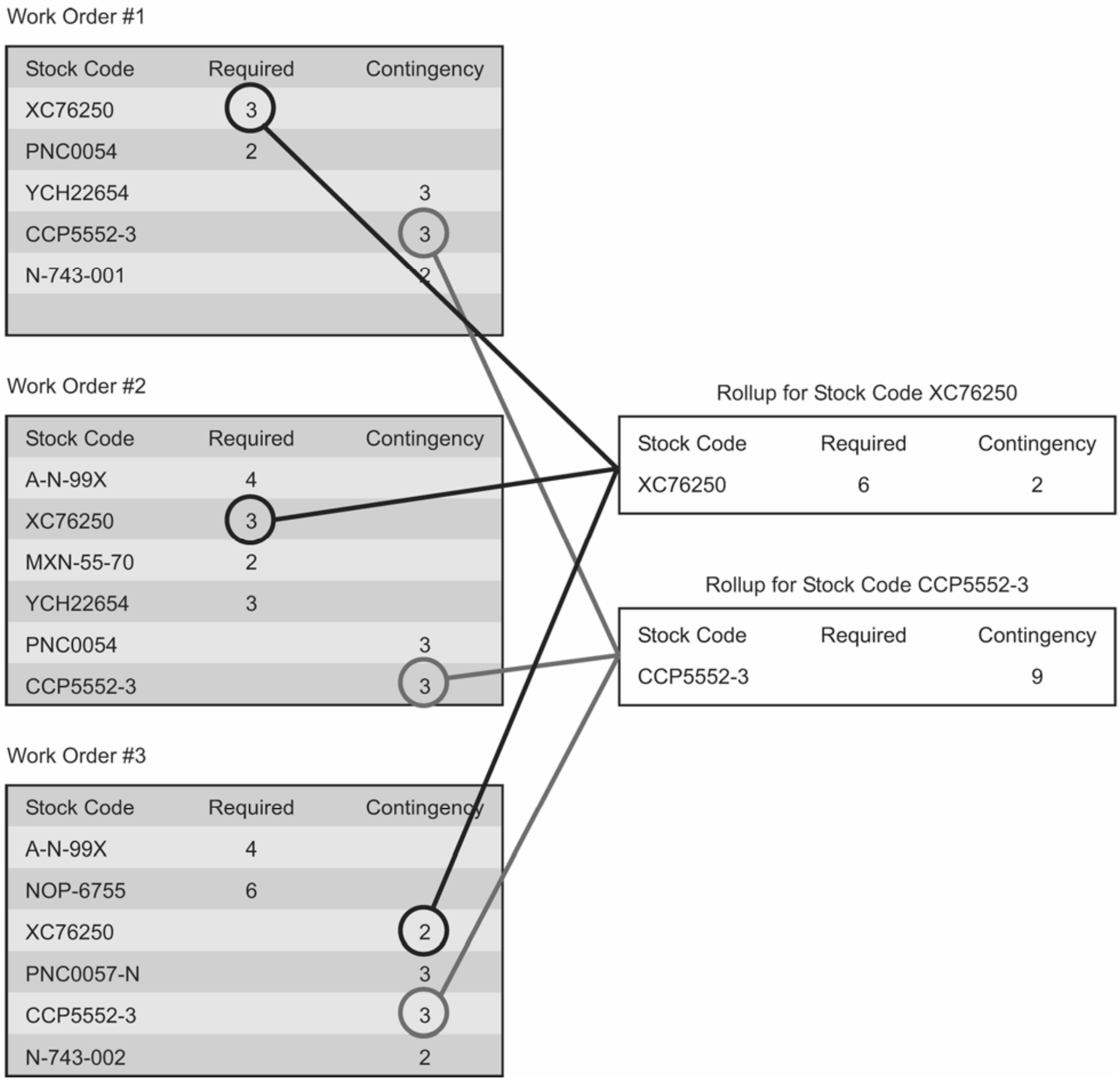

Figure 4-2
Demand Rollups for Two Stock Codes

Note that for Stock Code XC76250, the rollup identified a total required demand of six and a contingency demand for two of the item (that is, aggregate demands are six and two, respectively). For Stock Code CCP5552-3, the rollup identified no required demands but a contingency demand for nine of the item (that is, aggregate demands are zero and nine, respectively).

With the material demands entered into the procurement/work management system, the supply chain organization should then produce a report that compiles (or rolls up) identical part demands. This report should be reviewed by the appropriate SMEs to determine if the quantities for identical contingency and required parts should be adjusted to give the aggregate view of all work orders.

4.2.2 Rollup of Required Parts

The summation or compilation of required parts represents the total scope and quantities of parts that potentially several work planners (with input and assistance from other plant organizations) have identified as being required to perform the individually planned maintenance activities. Because these parts have been identified as being "required," the supply chain should ensure that they are available when needed. At this point, there should be no question regarding whether the need exists, and the supply chain should select the most cost-effective method of ensuring that the parts will be available when needed.

4.2.3 Rollup of Contingency Parts

The summation or compilation of contingency parts represents the total scope and estimated quantities of parts that may be needed to accomplish the planned work activities. However, before a decision is made regarding the availability of the contingency parts, an overall assessment of the contingency needs should be performed to refine the needs and optimize the risk associated with needing one of the parts and not having it available when it is needed. Section 5.1 of this report provides guidance on refining the contingency parts demand.

4.3 Examples of Rolled-Up Parts Demands

Figures 4-3 and 4-4 illustrate examples of rolled-up parts demands. A rollup is provided for a given stock code that summed/compiled demand information across of a number of work orders. The examples are provided for illustrative purposes only.

facility	stock_code	q_level	work_order	lmd	pwo	component_t	wo_qty_re	qty_avail_	qty_alloc_	po_pr_nbr	need_date
PSL	0035985	1	36008708	2	5904	PT-1100X	1	0	1		20061109
PSL	0035985	1	36008706	2	5902	PT-1103	1	0	1		20061108
PSL	0035985	1	36008704	2	5928	LT-9014	1	0	1		20061227
PSL	0035985	1	36008700	2	5910	LT-3311	1	0	1		20061226
PSL	0035985	1	36008699	2	5927	LT-9023C	1	0	1		20070101
PSL	0035985	1	36008707	2	5903	PT-1104	1	0	1		20061108
PSL	0035985	1	36008697	2	5923	LT-9013D	1	0	1		20061227
PSL	0035985	1	36008696	2	5921	LT-9023D	1	0	1		20070101
PSL	0035985	1	36008695	2	5920	LT-9023B	1	0	1		20061229
PSL	0035985	1	36008694	2	6043	LT-9013C	1	0	1		20061110
PSL	0035985	1	36008693	2	5919	LT-9013B	1	0	1		20061226
PSL	0035985	1	36008657	2	5918	LT-9022	1	0	1		20061228
PSL	0035985	1	36008654	2	5901	PT-1102D	1	0	1		20061107
PSL	0035985	1	36008653	2	5900	PT-1102C	1	0	1		20061107
PSL	0035985	1	35021935	2	5909	PT-3341	1	0	1		20061113
PSL	0035985	1	35021926	2	5907	PT-3321	1	0	1		20061109
PSL	0035985	1	35021921	2	5906	PT-3331	1	0	1		20061109
PSL	0035985	1	36008698	2	5925	LT-9023A	1	0	1		20061228
PSL	0035985	1	35020192	2	5917	PT-8013A	1	0	1		20061108
PSL	0035985	1	35006171	2	5916	PT-8023C	2	0	2		20061108
PSL	0035985	1	35006170	2	5915	PT-8023D	1	0	1		20061107
PSL	0035985	1	36008705	2	5929	LT-9024	1	0	1		20070102
PSL	0035985	1	35021933	2	5908	PT-3311	1	0	1		20061110
PSL	0035985	1	35006122	2	5914	PT-8023A	1	0	1		20061107
PSL	0035985	1	35006009	2	5913	PT-8013C	1	0	1		20061106
PSL	0035985	1	36008713	2	5905	PT-1102A	1	0	1		20061109
PSL	0035985	1	35006008	2	5912	PT-8013D	1	0	1		20061106

Figure 4-3
Sample Work Orders Compiled for Demand Rollups
(Courtesy of Florida Power & Light)

IM-0170 Material Request Contingency Materials

Nuclear Management Company, LLC

Pedigree Information

Facility: PRAIRIE ISLAND
Shutdown NBR:

Start Need Date: 1/1/02
End Need Date: 1/1/08

Work Week:
Report Date: 10/18/2006

Catalog id 268311 **Q Level** 0 **Stock Type** S **UI** LB **QtyDue In** 0.00 **QtyOnHand** 14.00 **Demand** 0.00

Cat PACKING, BULK, SQUARE, GRAPHITE REINFORCED WITH INCONEL

Mat Req #	MR Qty	Ref Type	Ref Nbr	Ref Sub Nbr	MR Title
22661	2	WO	79134	1	REPLACE PACKING GLAND
22662	2	WO	79133	1	REPLACE PACKING GLAND
22664	2	WO	79131	1	REPLACE PACKING GLAND
22666	2	WO	79129	1	REPLACE PACKING GLAND
22667	2	WO	79128	1	REPLACE PACKING GLAND
22668	2	WO	79127	1	REPLACE PACKING GLAND
22669	2	WO	79126	1	REPLACE PACKING GLAND
22670	2	WO	79125	1	REPLACE PACKING GLAND
22671	2	WO	79124	1	REPLACE PACKING GLAND
22677	2	WO	79123	1	REPLACE PACKING GLAND
22681	2	WO	79122	1	REPLACE PACKING GLAND
22682	2	WO	79121	1	REPLACE PACKING GLAND
22684	2	WO	79120	1	REPLACE PACKING GLAND
22687	2	WO	79119	1	REPLACE PACKING GLAND
22688	2	WO	79118	1	REPLACE PACKING GLAND
22694	2	WO	79114	1	REPLACE PACKING GLAND
22710	2	WO	79113	1	REPLACE PACKING GLAND
22872	2	WO	79103	1	REPLACE PACKING GLAND
Total Qty	36				

Figure 4-4
Example of Work Orders Compiled for Demand Rollups
(Courtesy of Nuclear Management Company)

5
CONTINGENCY PARTS DEMAND-VERSUS-AVAILABILITY ANALYSIS

This section provides guidance on analyzing the aggregate demand for contingency parts, refining those needs, and assessing the availability of the contingency parts identified.

5.1 Analyze Rollup and Refine Contingency Parts Needs

5.1.1 Review and Analyze the Demand for Contingency Parts

INPO AP-908 states that the overall intent of reviewing and analyzing demand is to ensure that the resulting material investment, material disposal, or services contract maintains safe and reliable plant operations and at the optimum cost to the licensee.

Material and service demand is driven by many factors, which may be proactive or reactive. To effectively minimize expediting or overstocking of materials, received demand quantity should be reviewed against historic usage as compared to known or projected future demands. Transaction cost should be considered in order to determine optimal procurement frequency. A challenge process should be instituted to optimize expenditures.

The demand for contingency parts should be reviewed and analyzed, considering many factors (some of which are listed next). As noted previously, the work planner should not assume the full burden for identifying either the demand for contingency parts or the method by which those parts will be made available if they are needed. The following factors should be considered when analyzing the aggregate demand for contingency spare or replacement parts:

- The company and/or site business plan
- Material availability from internal sources prior to purchase (that is, the ability to view all company inventory electronically, including shared/pooled inventory)
- The use of alternative suitable material that is currently in inventory or the need to purchase an item
- Validity of existing reservations and the optimum economic order quantities
- Whether a complete purchasing description is provided, including associated specifications, and whether the description meets minimum supplier’s requirements
- Hazardous materials usage and disposal restrictions requirements, associated costs, and alternative (less hazardous) options

- Evaluation of shelf life
- Materials currently on order
- Material currently in stock
- Supplier lead time
- Internal processing (that is, internal lead time)
- Item cost
- Historical usage
- Transaction cost
- Required department approval(s)
- Supplier alliances
- Service partnerships: ease of mobilization using pre-established agreements
- Material partnerships: ease of material acquisition using pre-established agreements
- How each rollup compares to established minimum/maximum stocking levels for a given stock code
- Procurement category (that is, basic component or commercial grade item [CGI])
- Knowledge of design information (must reverse-engineer the item)

5.1.2 Example Scenarios of Analyses of Contingency Parts Demand

This section presents examples of scenarios that may arise when analyzing the aggregate demand for contingency spares and how the licensee addressed that demand. These examples are for illustrative purposes only, and as such, the user of this report should consider his/her own site-specific requirements when assessing the need for contingency spare or replacement parts in support of an outage or on-line maintenance activities.

5.1.2.1 Diaphragm Replacement

The scope of work identified for the outage was to replace eight rubber diaphragms in a set of 2-in. (50.8-mm) diaphragm valves in the charging system. When replacing a rubber diaphragm, a spindle assembly and a metal backing plate may also be needed. Each work planner initially identified all of the parts (that is, the diaphragm, the spindle assembly, and the metal backing plate) as required, and none was considered to be contingent.

Without a rollup, each work order was processed individually, and the utility originally requested that complete sets of diaphragms, spindles, and backing rings be made available. After the work was performed, none of the spindles or backing rings was actually needed during the replacement of the diaphragms. At the completion of the work, the licensee was left with eight unused spindle assemblies and eight backing rings.

Lesson learned: Had the utility rolled up the eight work orders before the parts were procured, only the eight diaphragms would have been identified as required parts. The spindle assemblies and backing plates would have been identified as contingencies, and only two would have been procured. Instead, the licensee was faced with eight sets of excess unused parts that had to be returned to stock or sold as surplus.

5.1.2.2 Breaker Inspection and Repair

The scope of work in this example consisted of multiple inspections of 4160 breakers in the switchgear room. Known problems had already been identified with the breaker performance, necessitating inspections during normal outage PM. In this configuration, there were 10 breakers per bus and a total of 20 breakers. The scope of inspections included inspecting limit switches, contact switches, and motor-operated cells.

After inspection of the first breaker, two trip-and-close switches were identified as required based on the breaker conditions going into the outage. In addition, numerous contingencies were identified based on the scope of work described in the various PM work orders. A total of 20 work orders were rolled up (that is, one per breaker).

The rollup was performed by the supply chain organization that looked for common stock codes across all 20 work orders and developed a report. A meeting was conducted with maintenance, the breaker engineer (SME), and work planning to ensure that the rollup was accurate and reasonable.

Originally, the work planners identified 20 motor-operated cells, 20 limit switches, and 16 trip-and-close switches as required parts. After reviewing the roll-up report, the team decided to ensure that four of each item were made available as contingencies. In this case, the utility already had six limit switches and eight trip-and-close switches available in stock. However, because only two motor-operated cells were in stock, a procurement was made for two additional motor-operated cells so at least four of each contingency part would be available, if needed.

Two trip-and-close switches were replaced as anticipated, but none of the remaining breakers needed these items to be replaced. Three breakers were found to need new limit switches, but four contingencies were available and the work was performed. As the work proceeded, four of the first seven breakers needed motor-operated cells, and—after seven inspections—all of the contingencies were used up. As such, an expedited procurement was initiated to obtain 10 more. Only 8 of the remaining 13 breakers needed the motor-operated cells replaced; therefore, enough were available to perform the work.

Lessons learned: The rollup precluded the unnecessary procurement of limit switches and trip-and-close switches. For future inspections of similar breakers, consideration will be given to identifying the motor-operated cells as contingency but ensuring that a sufficient quantity is made available to meet anticipated needs.

5.1.2.3 Replacement of Pump Internal Parts

Among a set of 10 service water pumps, one failed catastrophically. One complete pump was in stock, and the decision was made to install the spare pump to replace the failed one instead of trying to repair the failed component. Prior to completing the failure analysis, the licensee initially considered replacing the remaining nine pumps. After completion of the failure and root cause analyses, a decision was made to repair the other nine on-line based on the extent of as-found conditions.

Initially, the procurement organization was instructed to procure nine complete sets of replacement parts in case they would be needed as each of the other nine pumps was inspected. After a meeting with maintenance, work planning, system engineering, the manufacturer, and the procurement organization, it was decided to procure contingency sets of parts for only three pumps at a time instead of contingency parts for all nine remaining pumps.

As the inspection and repair work proceeded, some of the contingencies were needed, but some were not. Thus, as each set of three remaining pumps was inspected and repaired, the need for procuring more parts was adjusted based on actual usage during the repairs that were already completed.

Lesson learned: The first major cost savings resulted from changing the scope of work from replacing nine components to repairing nine components (as needed). Additional cost savings resulted from procuring only a third of the contingency parts and adjusting the scope and quantities of additional contingency parts based on the repair experience gained on the preceding sets of pumps. The meeting of the key organizations facilitated a plan that provided the parts if and when they were needed while simultaneously minimizing the amount of unused parts.

5.1.2.4 Repair of Diesel Generators

Four emergency diesel generators were scheduled for refurbishment. The work was planned to be performed while the unit remained on-line. The refurbishment scope of work included replacing piston assemblies, which include piston cylinders, pistons, and rings, on an as-needed basis. There are 14 assemblies for each emergency diesel generator, and piston assemblies have a 36-week lead time because they are manufactured overseas. There were two assemblies in stock.

The work planner identified all of the 56 assemblies as contingency parts because it was uncertain whether any of them would be needed during the refurbishment. A team consisting of maintenance, work planning, system engineering, the manufacturer, and the procurement organization reviewed replacement experience at other plants in their fleet as well as industry experience. The team decided to procure 12 contingency piston assemblies so that one complete set of 14 would be available at the start of the work.

After work commenced on the first diesel, it was learned that only one of the piston assemblies needed to be replaced. On the second diesel, three needed replacement; on the third diesel, one needed replacement; on the fourth diesel, two needed replacement. The remaining seven piston assemblies were returned to inventory.

Lesson learned: The work planner correctly identified the items as contingencies because none of them was known to be needed prior to the start of the work. The utility used a multi-organizational team (including a representative from the manufacturer) to assess how many of the contingencies, if any, needed to be made available. Because of the long lead time, the utility immediately procured enough so that one complete set would be on hand at the start of the work. Although only half of them were needed, the work was able to commence as scheduled.

5.2 Analyze Availability of Contingency Parts

5.2.1 Availability Factors for Consideration

A key aspect of meeting identified needs for parts is an assessment of the availability of the item if it is needed. The following factors should be considered regarding the availability of an item to meet an identified need:

- Availability of the part:
  - Is it already in stock?
  - What are the lead times associated with various procurement options?
- Probability of not using the parts (resulting in dormant or excess inventory)
- Economic impact of the unused parts (for example, stored, in surplus, sold, or scrapped)
- Availability of an individual item in lieu of an entire kit
- Ability and feasibility to reverse-engineer and fabricate the item
- Ability and feasibility to dedicate a CGI
- Ability to obtain (that is, scavenge and remove/cannibalize) piece-parts from complete host equipment (either in stock or installed)
- Ability to evaluate an alternative item that may be suitable for the given application (that is, an equivalent item)
- Ability to repair or refurbish the item instead of replacing it
- Item’s functional safety classification (safety-related [SR] versus NSR)
- Obsolescence potential of the item

5.2.2 Communicating Availability Methods and Options to Work Planning

Key Human Performance Point

The supply chain organization should make work planners aware of the way in which each contingency part will be made available if the item is needed.

INPO AP-908 guidance states that supply chain organizations should ensure that the following issues are addressed proactively and interactively with station departments prior to and during procurement to ensure that timely and cost-effective procurement practices are achieved and that the parts will be available if and when they are needed:

- Lead time, shipping requirements, costs, and other particulars are determined and addressed proactively with key station personnel.
- The facility has an established “stocking plan” policy and strategy.
- Scope is determined and procurement requirements are addressed during demand identification or initiation.
- Processes encourage engineering and end users to use in-stock materials versus buying.
- A program is in place to identify potential unneeded spare parts in inventory as a result of design modifications.
- A process is in place to evaluate major equipment or critical items being replaced during modification and maintenance activities to determine whether parts needed are currently available in the marketplace.
- A programmatic approach is in place with station personnel to ensure that there is adequate justification or validation of requests to add items to inventory and that the requestor provides adequate purchase specifications.
- A process is in place to verify and coordinate availability and cost of materials in support of the planning process.
- A process is in place to ensure that BOMs are created and maintained accurately.
- Early supplier input should be established for engineered materials, large-order quantities, repetitive purchases, or where economically favorable.
- A “make/buy decision” is formalized for appropriate items (that is, capitalized spares, large-dollar repairs, long-lead-time items, and repairs).
- Single-point visibility is provided for demand management with integration to the work management (refer to INPO AP-928).
- Requisitions are automatically routed to the correct single point of contact to support procurement.
- SMEs (that is, those possessing the most knowledge in a particular area) are identified and engaged with maintenance and work planners in support of procurement activities. The system engineers or SMEs must also provide feedback from equipment reliability (ER) (to the suppply chain organizations) on critical and important spare parts needs (refer to INPO AP-913).
- A systematic approach is in place that ensures that inventory is reviewed to identify items not needed to be maintained in inventory.

5.2.3 Options for Meeting Contingency Spare or Replacement Parts Demand

5.2.3.1 Inventory Is Available to Meet the Demand for Contingency Parts

If there is sufficient quantity on hand to meet demand requirements, the demand requirement should be satisfied using inventory quantities. In this scenario, the work planners should be made aware that the contingency parts will be furnished using in-stock items if the need arises during work activities. The maintenance organization, as defined in site processes, should dictate whether the contingency spares should be issued or staged.

Key O&M Cost Point

If contingency parts are staged after being issued from the inventory control system, the parts may not be visible to other potential users. This may consequently result in an unnecessary purchase if the staged contingency part is not needed.

Key O&M Cost Point

If contingency parts are issued from the inventory control system, the item may become damaged and may not be usable or may be returned to inventory as is.

5.2.3.2 Inventory Is Insufficient to Meet the Demand for Contingency Parts

If there is insufficient quantity to meet the aggregate demand for contingency spares, the following options should be considered:

1. Procure sufficient inventory to meet the aggregate demand for contingency spares and maintain the minimum inventory level.
2. Assess other methods for making the item available if it is needed. These options may include the following:
   – Establish consignment agreement with supplier.
   – Make arrangements for a JIT procurement.
   – Prepare for a utility transfer from another plant within the fleet.
   – Prepare for an inter-utility purchase (located with the RAPID search engine or pooled inventory management system).
3. Delay procurement of additional parts until the inventory reaches its pre-established reorder point.
4. Do nothing and accept the risks of not having the item if it is needed, and document the decision.

These four options are ranked from the least risk (Option 1) to the highest risk (Option 4). The supply chain organization should ensure that all affected organizations are aware of the decision that is made regarding how the identified/aggregate need for contingency parts is addressed and to what extent those parts will be made available.

Other options to consider at this point are modifying the scope of work and eliminating the need to make the contingency part available as well as others as noted in Section 5.2.1.

5.2.4 Follow-On Activities

After ensuring that the necessary parts are made available, the licensee should consider reviewing demand and usage against its site/fleet stocking plan. An illustrative example of how this may be accomplished is provided in Appendix B of this report.

6
PROCESS MEASUREMENT

6.1 General Guidance

With regard to parts used during maintenance activities, an ideal situation would be described as follows:

- No contingency parts were required for each maintenance activity.
- Every part that was required was available.
- Every part that was required was procured at the least cost to the licensee.
- No parts were procured, stored, or issued to the field unnecessarily.

However, given some level of uncertainty surrounding parts required for each maintenance activity and the level of risk deemed acceptable by the licensee regarding the availability of parts, the ideal situation is almost never achievable. The licensee should establish methods and capture data points that trend how well it identifies and subsequently meets material needs.

6.2 Performance Measurement Organizations

In most cases, the supply chain organization should have a method of measuring how effectively material needs are being met. In addition, the work planning or maintenance organization should have a method of measuring how accurately material demands were established and communicated to the supply chain organization. Both organizations (that is, the supply side and the demand side) should be accountable to some extent regarding their respective roles and responsibilities in the overall process for material usage and supply.

6.3 Performance Measurement Options

The following metrics and data points should be considered as a method of measuring the effectiveness of the material demand identification process and, subsequently, the supply and availability of those items. The user of this report should treat these performance measures as options for consideration and not as requirements. It is unlikely that any licensee will opt to implement all of these measures because the intent is to provide a wide array of data points for selection by each licensee.

6.3.1 Measuring the Effectiveness of Identifying and Meeting Contingency Material Demands

Figure 6-1 illustrates a supply-versus-demand matrix for contingency parts. Each quadrant of the matrix represents outcomes associated with both the identification of the part demand and whether the item was made available. The licensee should consider developing a way to measure the outcomes of each quadrant as a method of trending the effectiveness of identifying and meeting contingency parts needs.

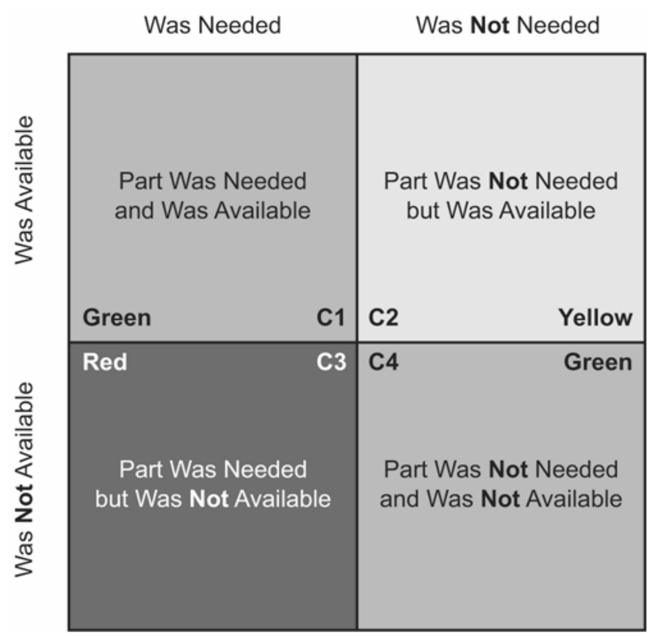

Figure 6-1
Measuring the Effectiveness of Identifying and Meeting Contingency Material Demands

Each quadrant in Figure 6-1 represents the following:

- C1: The contingency part was needed and available. In this outcome, the part—though determined to be a contingency item—was, in fact, required for the job. Adjustments should be considered for future work to identify this as a required part instead of a contingency part. The licensee should continue to ensure that these items are available to support the given scope of work.
- C2: The contingency part was not needed and available. In this outcome, the contingency part determination was correct because it was, in fact, not required for the given scope of work. It was available, however, just in case it was needed. Had the part been procured specifically to support this work, the licensee should ensure that future procurements are postponed until either a required need is determined or the stocking level reaches its minimum threshold.
- C3: The contingency part was needed and not available. In this outcome, the part—though determined to be a contingency item—was, in fact, required for the job and was not available. Adjustments should be considered for future work to identify this as a required part

instead of a contingency part. And regardless of whether the item is considered contingency or required, the licensee should ensure that these items are available to support the given scope of work.

- C4: The contingency part was not needed and not available. In this outcome, the contingency part determination was correct because it was, in fact, not required for the given scope of work. The licensee's decision not to make the item available also proved to be correct.

6.3.2 Measuring the Effectiveness of Identifying and Meeting Required Material Demands

Figure 6-2 illustrates a supply-versus-demand matrix for required parts.

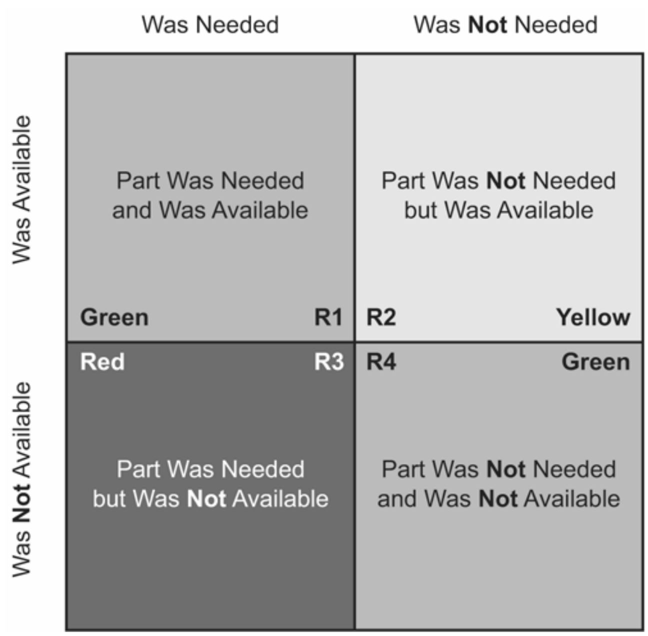

Figure 6-2
Measuring the Effectiveness of Identifying and Meeting Required Material Demands

Each quadrant in Figure 6-2 represents the following:

- R1: The required part was needed and available. In this outcome, the required part determination was correct because it was, in fact, required for the job. The supply chain also ensured that the item was available when needed.
- R2: The required part was not needed and available. In this outcome, the part determination was incorrect because it was, in fact, not required for the given scope of work. It was available, however, just in case it was needed. Adjustments should be considered for future work to identify this as a contingency part instead of a required part. Had the part been procured specifically to support this work, the licensee should ensure that future procurements are postponed until either a required need is determined or the stocking level reaches its minimum threshold.

- R3: The required part was needed and not available. In this outcome, the required part determination was correct because it was, in fact, required for the job, but it was not available. The licensee supply chain organization should ensure that these items are available to support the given scope of work.
- R4: The required part was not needed and not available. In this outcome, the required part determination was incorrect because it was not required for the given scope of work. Adjustments should be considered for future work to identify this as a contingency part instead of a required part. The licensee's decision not to make the item available had no adverse impact only because the part was not needed. Had the item been required, an outcome similar to R3 would have resulted.

Key O&M Cost Point

The licensee should consider applying the performance metrics described in this report for activities associated with either preventive or corrective maintenance.

It is often difficult for the work planning organization to accurately define the material needs for a given scope of work. The following measures should be used as way to improve the overall material demand process and not as tools for measuring the ability or qualifications of the work planners themselves. The following data points should be considered as possible methods for measuring the accuracy of the material demand identification process:

- Number and/or dollar value of parts procured to meet required needs that were not used (that is, returned to inventory). This measure can provide an indication of the number of parts that were identified as required but, in fact, were not actually needed to perform the defined scope of work. The results of this measure should enable the licensee to decrease the number of required parts for a given scope of work for future maintenance activities. This outcome could result from the R2 scenario shown in Figure 6-2.
- Number and/or dollar value of contingency parts that were required to perform the maintenance activity. This measure can provide an indication of the number of parts that were identified as contingency (that were available) and were actually needed to perform the defined scope of work. Depending on the reason the parts were needed, the results of this measure may enable the licensee to increase the number of required parts for a given scope of work for future maintenance activities. This outcome could result from the C1 scenario shown in Figure 6-1.

6.3.3 Measuring the Effectiveness of Material Supply

The work planning organization should not be solely responsible for determining the level of availability for a given material demand. The supply chain organization should be responsible for ensuring that required parts are available when needed, and most licensees have methods in place for measuring how effectively material demands are met. The following data points should be considered as possible methods for measuring the effectiveness of the material supply processes:

- Number and/or dollar value of required parts that were not available when needed. This measure can provide an indication of process deficiencies in the supply chain organization; however, industry experience suggests that this is typically not a problem at most nuclear utilities. This outcome could result from the R3 scenario shown in Figure 6-2.
- Number and/or dollar value of contingent needs that were met unnecessarily. In this case, the demand was correctly identified as being a contingency because the parts were not actually needed and used, yet the needs were still met. So in this scenario, the licensee correctly identified the need but conservatively ensured that the parts would be available "just in case" the parts would be needed when maintenance activities commenced. This scenario should not be a negative performance measure against the supply chain because the need (though unnecessarily) was met. Neither should this scenario be a negative performance measure against the work planning organization because the need was correctly identified as a contingency. This outcome could result from the C2 scenario shown in Figure 6-2.

In this scenario, it behooves the licensee to determine the impact of unnecessarily meeting contingency needs. The impact is much less significant if the parts were already in stock and were only issued and returned to inventory.

Key O&M Cost Point

Not all contingency parts procured must be issued to the field (that is, they can stay in the warehouse).

However, the impact is more significant if the parts were procured and not used. In this case, the licensee is then faced with how to dispose of the unneeded/unused material in the most cost-effective manner. Disposition of unneeded/unused material may include any of the following processes:

- Retain the material to meet future needs if they arise.
- Scrap the material.
- Sell the material to other licensees.
- Return the material to the vendor (possibly incurring restocking fees).

- Transfer the material to another site/unit (nuclear or fossil) within the utility that has a need for the item.
- Sell the material on the commercial market to salvage some of the purchase costs.

Licensees should establish methods for determining why purchased and issued contingency parts were returned to inventory. Aside from the item not being needed for a defined work scope, other reasons this occurs are the following:

- Wrong part (not suitable for the application)
- Work order not performed (cancelled, rescheduled, or deferred)
- Unacceptable part (broken or nonconforming) according to condition report

6.3.4 General Measures of Both Processes

Rather than attempt to separately measure each process (that is, demand identification and, subsequently, the supply), the licensee may consider using one or more of the following general measures of the materials management process:

- Number and/or dollar value of returning parts post-work week or post-outage. This data point can provide an indication of the number or value of parts not needed and not used on a work week basis. Further investigation may be required, however, to determine the cause of the return. In this case, it may not be readily apparent if the return was caused by an overly conservative identification of required parts or a decision to purchase parts that were correctly identified as contingency. This outcome could result from either the C2 or R2 scenarios shown in Figures 6-1 and 6-2, respectively.
- Amount of dollars spent on expediting contingency parts. This performance measure may be considered if the licensee associates high expediting costs with an indication that the expedited parts were actually required and not contingencies. This then would provide some indication that the parts were not correctly identified and should have been identified as required. Depending on the reason the parts were needed, the results of this measure may enable the licensee to increase the number of required parts for a given scope of work for future maintenance activities. This outcome could result from the C1 or C2 scenarios shown in Figure 6-1.
- Growth of inventories. This performance measure may be valuable if the licensee suspects that its inventory is increasing because contingency parts were procured, not needed, and returned to stock. Over time, this practice will inevitably cause the inventory to grow as long as other methods for optimizing or reducing the inventory are not used. Each licensee should recognize that an inventory of readily available spare or replacement items is not necessarily a bad thing and provides a high level of assurance that items will be immediately available if and when they are needed. This outcome could result from either the C2 or R2 scenarios shown in Figures 6-1 and 6-2, respectively.

Each licensee should assess the level of increase that is acceptable for its inventories as well as what the optimal inventory for each site or unit should look like. Additional guidance on this is provided in EPRI report TR-109648, *Inventory Optimization in Support of the EPRI Work Control Process Module*.

- Adverse impacts. This performance measure may be valuable if the licensee suspects that the unavailability of parts may be adversely affecting its ability to meet technical specification or Maintenance Rule requirements or causing LCOs (that is, these are critical or essential parts). In this scenario, the licensee should consider methods of quantifying the costs associated with not having parts when they are needed, based on the adverse impact on plant operating performance and equipment reliability. This outcome could result from either the C3 or R3 scenarios shown in Figures 6-1 and 6-2, respectively.

7 REFERENCES

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A
WORK PLANNER CHECKLIST

This appendix provides a checklist that the work planner can use to assist him/her in making an initial determination of required parts for a given scope of work. In general terms, the work planner should first be provided with a clear definition of the scope of work. Also key is having access to and reviewing the following:

- Current work order history
- Parts usage history
- A mature and accurate component parts lists (that is, bill of material [BOM], including part-level information) and/or the ability to build the lists from each work order completed
- Accurate drawings and vendor technical manuals

The work planner should have a good understanding of the parts planning/reserving process from work planning, maintenance, procurement, and scheduling perspectives. In addition, he/she should appreciate the need for maintaining good configuration control.

Table A-1 provides an example of a checklist that the work planner should use to assess the applicability of numerous other factors that assist in the determination of required parts for a given scope of work. The table is provided for illustrative purposes only and should not be interpreted as an all-inclusive list.

Table A-1
Example of Work Planner Checklist for Determining Required Parts

Work Planner Checklist for Determining Required Parts: Scope of Work		
Design Basis Requirements of the Host Component	**Applicable**	**Not Applicable**
Component work scope impacts limiting condition for operation (LCO) and technical specification		
Component work scope impacts application of Maintenance Rule		
Environmentally qualified component		
Seismically qualified component		
Shutdown safety component		
ASME Section III component		

Table A-1 (continued)
Example of Work Planner Checklist for Determining Required Parts

Work Planner Checklist for Determining Required Parts: Scope of Work		
Design Basis Requirements of the Host Component (continued)	**Applicable**	**Not Applicable**
Non-power block equipment		
Boric acid components		
Scope, Type, or Category of Maintenance		
Work scope includes in-service testing of the component		
Work scope includes in-service inspection of the component		
Work scope includes local leak rate test (containment integrity component)		
Temporary design change required		
Troubleshooting plan required		
Work scope includes on-line leak repair		
Work scope affects reactivity management or fuel pool cooling		
Component requires freeze seal isolation		
Work scope requires compensatory actions or measures		
Work scope impacts environmental/chemistry program		
Component requires post-installation testing to complete commercial grade item (CGI) dedication		
Work scope includes ASME Section XI repair and replacement activities		
Work scope includes irradiated fuel movement		
Work scope presents a potential risk to loss of generation		
Scope of work is repair in lieu of component replacement		
Programs and Other Issues Associated with the Host Component		
Plant operating experience		
As low as reasonably achievable (ALARA)		
Personnel safety issues		
ASME Section VIII requirements apply		
Public safety issues		
Fire protection issues		

B
REVIEWING DEMAND AND USAGE AGAINST THE STOCKING PLAN

B.1 Review Demand and Usage Against the Stocking Plan

As suggested in INPO AP-908 and EPRI report TR-109648, *Inventory Optimization in Support of the EPRI Work Control Process Module*, demand and usage history should be key inputs when developing a stocking plan. This appendix provides an example of how one utility used parts demand and usage history information to implement a stocking plan aimed at optimizing the size and content of its inventory. The example is provided for illustrative purposes only and does not suggest that the methodology presented is the only feasible method available.

B.1.1 Adjusting the Stocking Plan Based on Demand

A follow-up activity to the demand analyses, outage activities, and actual usage of contingency spares is a review of the stocking plan by the supply chain organization. The overall objectives of reviewing the demand against the stocking plan are to determine whether a new stock code is required and to identify excess materials that may be handled through the disposition process.

INPO AP-908 suggests that each facility should establish a documented stocking plan against which each material demand requirement is reviewed. Materials that are deemed potential excess or surplus should be reviewed against the stocking plan prior to being classified as excess or surplus and being disposed.

An effective stocking plan would normally include consideration of whether the item is:

- A new or replacement material
- Addressed by the Maintenance Rule
- Safety or augmented-quality material
- A chemical
- A radioactive material
- Measure and test equipment (M&TE)

- A spare that is used and subsequently procured frequently
- One with a long lead time
- A critical spare according to equipment reliability (ER) (INPO AP-913)

The supply chain organization should also consider the following qualitative factors when assessing the current stocking plan for an item identified as a contingency spare:

- Whether the item supports (or may support) an approved plant design modification or is a repair or spare part for a plant modification
- Failure consequences (for example, outage, power reduction, or operation in a limiting condition for operation [LCO])
- Number of applications for the item
- Usage patterns or frequency of use
- Special storage requirements
- Maintenance requirements
- Inventory and storage costs
- Item cost
- Item availability
- Usage history
- Quantity over maximum
- Shelf-life requirements
- Whether the item is being replaced by a new item
- Whether the item is obsolete in the marketplace

B.1.2 Stocking Plan Example

The following is an example of how a licensee with a fleet of nuclear power plants programmatically assessed its stocking plans to better align them with both the criticality of the host equipment and the demand. The first step in the process was to establish an identification code for a given component based on its functional location (FLOC). The component critical classification code designations are provided in Table B-1.

Table B-1
Example of Component Critical Classification Code Designations

Character	Component/Functional Location Criticality Classification
A	The FLOC is critical.
B	The FLOC is noncritical.
C	The FLOC is run to failure or (non-impact).
N	This represents items that are not associated with a FLOC.

In this example, all stock codes associated with a FLOC are given the same component criticality code (for example, a safety shutdown valve has a "critical" classification). Therefore, all stock codes associated with this FLOC should have a component criticality classification of "A." This information is located in a licensee's information management system under the associated stock code.

Stock codes associated with multiple FLOCs with different criticality classifications are associated with the highest criticality level. For example, a stem valve is associated with two FLOCs. One has a criticality classification of "critical," the other "run to failure." The stock code should have an "A" indicator because it is the highest criticality classification with which the stock code is associated.

For this licensee, not all the stock codes associated with a criticality classification must be stocked to a critical level or have a service level as high as the asset's criticality code. Using the previous example, a safety shutdown valve has a critical classification code of "A = critical"; therefore, all stock codes associated with this FLOC will have a functional criticality classification of "A." However, based on a review of the stock codes associated with this asset, the stock code for the handwheel does not need to be stocked. As such, the supply chain developed a second criticality classification that relates to the stocking of parts.

The stocking level criticality classification is a two-character code that is assigned to a stock code to indicate the stock-level decision. Personnel assigned to the licensee's supply chain organization make this decision. This designation influences the quantities that are stocked in the warehouse. Supply chain personnel set key materials requirements planning (MRP) elements based on the component and stocking level classifications (such as MRP type, lot size, reorder point, and rounding value).

The first character of the stocking level classification designates the component criticality (that is, "A," "B," or "C"). A fourth classification was added ("N" = null), which designates a stock code that is not associated with a FLOC. The second character designates the stocking level decision. It also uses an "A," "B," or "C" designation that represents the service level required for the stock code. Table B-2 defines the three stock-level designations.

Table B-2
Example of Stock-Level Designations

Character	Component/Functional Location Criticality Classification
A	A stock level that must meet a service level of 99%
B	A stock level that must meet a service level of 95%
C	A stock level that must meet a service level of 90%

Service levels are based on having the item available for work orders 99% of the time requested.

In this example, the licensee developed a conversion strategy that was then used to populate stocking level criticality classification codes and MRP data for all fleet stock codes based on the equipment modernization plan's designation of the component's criticality classification. Matrices were then developed that identified the characteristics and preferred MRP parameters for items with previously determined stocking level classification codes covering the entire range of code combinations (that is, AA, AB, AC, AN, BA, BB, and so on). Table B-3 illustrates an example of the stocking plan matrix for an item designated as "AA."

Table B-3
Example of Stocking Basis and Level Determination

Stocking Level Classification	Item Characteristics	Preferred MRP Parameters	Comments
AA	Item is associated with at least one "critical" FLOC and has been identified as a critical spare. Determination of the item as a critical spare is based on the following: • FLOC maintenance philosophy identified within ER database • Verification with maintenance • Conservative setting applied until determined by maintenance	MRP type Lot size Reorder point (ROP) is manually determined based on projected usage (and safety stock). (Note: minimum ROP of one should be applied if usage is inconsistent or unknown.) Maximum stock level is required and should reflect the maximum inventory level to be maintained when no reservations exist.	Assurance is desired that the supply chain will have the item in inventory 99% of the time that it is requested. A quantity of at least one should be on hand for items with inconsistent or unknown demand. The preferred MRP parameters have been defined to achieve several goals: • At least one item will be maintained in inventory to cover emergent situations. • All additional planned requirements will be covered. • After requirements have been covered, the defined maximum stock level will not be exceeded but also does not have to be reached if not economically justified. • A balanced stock/requirements situation is therefore given higher priority than the lot-sizing procedure.

C
LISTING OF KEY INFORMATION

C.1 Key O&M Cost Points

The following provides the location of Key Point information in this report.

Key O&M Cost Point

Emphasizes information that will result in reduced purchase, operating, or maintenance costs.

Section	Page	Key O&M Cost Point
3.2.2.1	3-4	The better the scope of work is defined, the more accurately the work planner can estimate the parts required to perform the work.
3.2.2.1	3-4	When work scopes are poorly defined, a work planner is more likely to identify more required parts than are actually needed and is less able to identify contingency parts.
3.2.2.3	3-5	Inadequate and/or incomplete BOMs have a significant impact on an organization's ability to identify, track, and manage contingency parts required for either on-line or outage maintenance activities.
3.2.2.3	3-5	Some information management systems (for example, Passport) have the capability to develop a parts list based on past parts usage/issues for a given component.
3.3	3-7	Because a part is identified as contingency should not imply that it will not be available if it is needed.
3.3.1.1	3-7	Assistance from organizations other than work planning results in a more accurate determination of parts demand.
3.3.1.2	3-8	Supply chain, maintenance, and work planning personnel should document maintenance philosophies to ensure effective communication and to optimize the materials availability process.
3.3.1.3	3-8	Work planners should not assume that designating a part as contingency will result in it not being available or that it will not be procured.
3.3.2.3	3-9	Site information systems should be able to distinguish between a required part and a contingency part.

Section	Page	Key O&M Cost Point
3.4.1	3-15	Risk assessments for contingency parts that cost more than the predetermined threshold amount should be performed with a team of plant personnel and should be documented.
5.2.3.1	5-7	If contingency parts are staged after being issued from the inventory control system, the parts may not be visible to other potential users. This may consequently result in an unnecessary purchase if the staged contingency part is not needed.
5.2.3.1	5-7	If contingency parts are issued from the inventory control system, the item may become damaged and may not be usable or may be returned to inventory as is.
6.3.2	6-4	The licensee should consider applying the performance metrics described in this report for activities associated with either preventive or corrective maintenance.
6.3.3	6-5	Not all contingency parts procured must be issued to the field (that is, they can stay in the warehouse).

C.2 Key Technical Points

Key Technical Point

Targets information that will lead to improved equipment reliability.

Section	Page	Key Technical Point
3.2.2.5	3-6	Supply chain personnel and work planners placing demands on materials must be familiar with the others' processes and policies to ensure that the optimal quantities of materials are procured.

C.3 Key Human Performance Points

Key Human Performance Point

Denotes information that requires personnel action or consideration in order to prevent injury or damage or ease completion of the task.

Section	Page	Key Human Performance Point
3.2.2.2	3-5	When reviewing past work order material usage history, work planners should consider both material that was issued to a work order and material that was returned if not used. Issued material by itself may not be a sufficient method on its own to determine material usage.
5.2.2	3-5	The supply chain organization should make work planners aware of the way in which each contingency part will be made available if the item is needed.

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ORGANIZATION(S) THAT PREPARED THIS DOCUMENT

Electric Power Research Institute (EPRI)

レポートの概要

目的

- ワークプランニングの職員に対し、主として燃料取替定検中に実施されるメンテナンス活動の支援において“ 偶発事に備えた予備部品”（コンティンジェンシー・スペア（パーツ））または取替部品を決定するための一般的なプロセスと実施のガイダンスを提供すること
- ワークプランニングの職員（一般に部品の必要性を確認する責任がある）と調達部門（確実に必要資材を確保する責任がある）との相互連携を高めること

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RESUMEN DEL INFORME

Objetivos

- Proporcionarle al personal de planificación de trabajos una guía de implantación y un proceso genérico para determinar las piezas de recambio o repuestos de contingencia que necesitan y de esa forma apoyar en las actividades de mantenimiento que normalmente se realizan durante la recarga de combustible.
- Mejorar la interrelación entre el personal de planificación de trabajos – quienes son normalmente los responsables de identificar las necesidades de piezas – y la organización de la cadena de suministro - que es responsable de asegurarse que se satisfacen las necesidades materiales.

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