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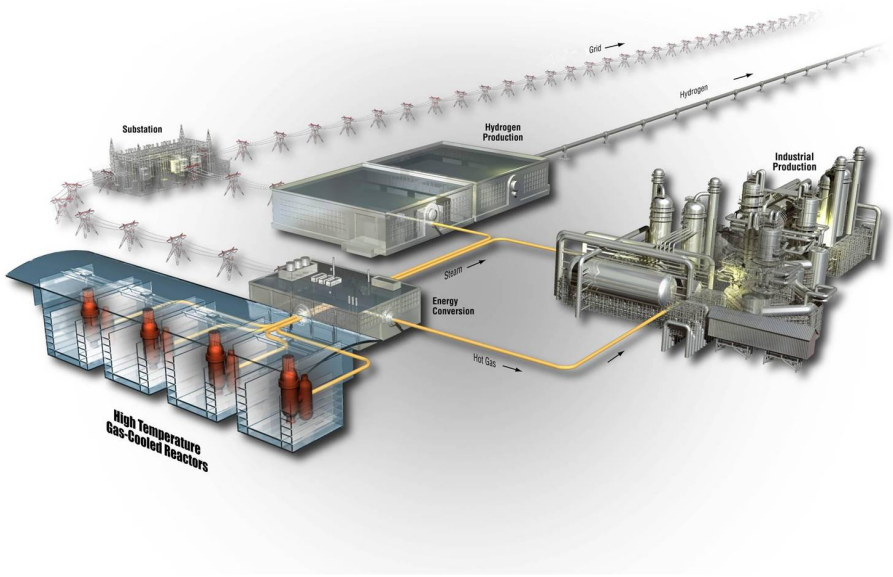
Revision 1

# NGNP Risk Management Database: A Model for Managing Risk

John M. Beck

November 2011

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**Next Generation Nuclear Plant Project**

# NGNP Risk Management Database: A Model for Managing Risk

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**Revision 1**

**November 2011**

**Approved by:**

| | |
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| John W. Collins<br>Lead Systems Engineer | 01 Nov 2011<br>Date |
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# REVISION LOG

| Rev. | Date | Affected Pages | Revision Description |
|---|---|---|---|
| 1 | 11-01-2011 | pp. 1, 2, 7, 8. | Incorporation of latest RMS features and functions updates. |
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# ABSTRACT

The Next Generation Nuclear Plant (NGNP) Risk Management System (RMS) is a database used to maintain the project risk register. The RMS also maps risk reduction activities to specific identified risks. Further functionality of the RMS includes mapping reactor suppliers Design Data Needs (DDNs) to risk reduction tasks and mapping Phenomena Identification Ranking Table (PIRTs) to associated risks. With this mapping the users can identify which DDNs are addressed and which PIRTs are captured in the project risk register. This document outlines the basic instructions on how to use the RMS.

This document constitutes Revision 1 of the NGNP Risk Management Database: A Model for Managing Risk. It incorporates the latest enhancements to the RMS. The enhancements include six new custom views of risk data—Impact/Consequence, Tasks by Project Phase, Tasks by Status, Tasks by Project Phase/Status, Tasks by Impact/WBS, and Tasks by Phase/Impact/WBS.

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# FIGURES

# ACRONYMS

| | |
|---|---|
| CD | compact disk |
| DDN | Design Data Need |
| NGNP | Next Generation Nuclear Plant |
| PIRT | Phenomena Identification and Ranking Table |
| R&D | research and development |
| RMS | Risk Management System |
| PASSC | plant, area, system, subsystem, and component |

# NGNP Risk Management Database: A Model for Managing Risk

## 1. System Objective

To facilitate the implementation of the Risk Management Plan, the Next Generation Nuclear Plant (NGNP) Project has developed and employed an analytical software tool called the NGNP Risk Management System (RMS). A relational database developed in Microsoft® Access, this tool provides conventional database utility, including data maintenance, archiving, configuration control, and query ability. Additionally, the RMS provides a number of unique capabilities specifically designed to facilitate the development and execution of activities outlined in the Risk Management Plan. Specifically, the RMS provides the capability to establish the risk baseline; document and analyze the risk reduction plan; track the current risk reduction status; organize risks by reference configuration plant, area, system, subsystem, and component (PASSC); and increase the risk knowledge of NGNP decision makers.

## 2. System Functions

To accomplish this objective, the system employs a Hierarchy Viewer that provides a rollup/drilldown analysis capability and summarizes quantitative risk scores at various levels of granularity, as shown in Figure 1. The risk scores can be displayed for either the baseline, current status, or the final projected risk. Risks can be rolled up by average or worse case for a selected design configuration. The tool's Hierarch Viewer also allows the visualization and analyses of the complex relationships between various NGNP data entities (e.g., Critical PASSCs, Risks, Risk Mitigation Tasks, Design Data Needs [DDNs], and Phenomena Identification and Ranking Table [PIRTs]).

The RMS provides hierarchal views of risks based upon available scenarios. For technical risks, these scenarios provide a view of risks based upon alternative reactor configurations. The available scenarios are: 750 Deg. Prismatic, 750 Deg. Pebble Bed, 950 Deg. Prismatic, 950 Deg. Pebble Bed, All Prismatic, All Pebble Bed, All 950 Deg., All 750 Deg., All Scenarios, Steam Cycle Modular He, AREVA HTR-Module, and Process Heat Modular He. Since, a risk may be higher or lower for different scenarios, each risk is evaluated against each scenario. The user can view the risks at a plant, area, or system for any one of the above scenarios.

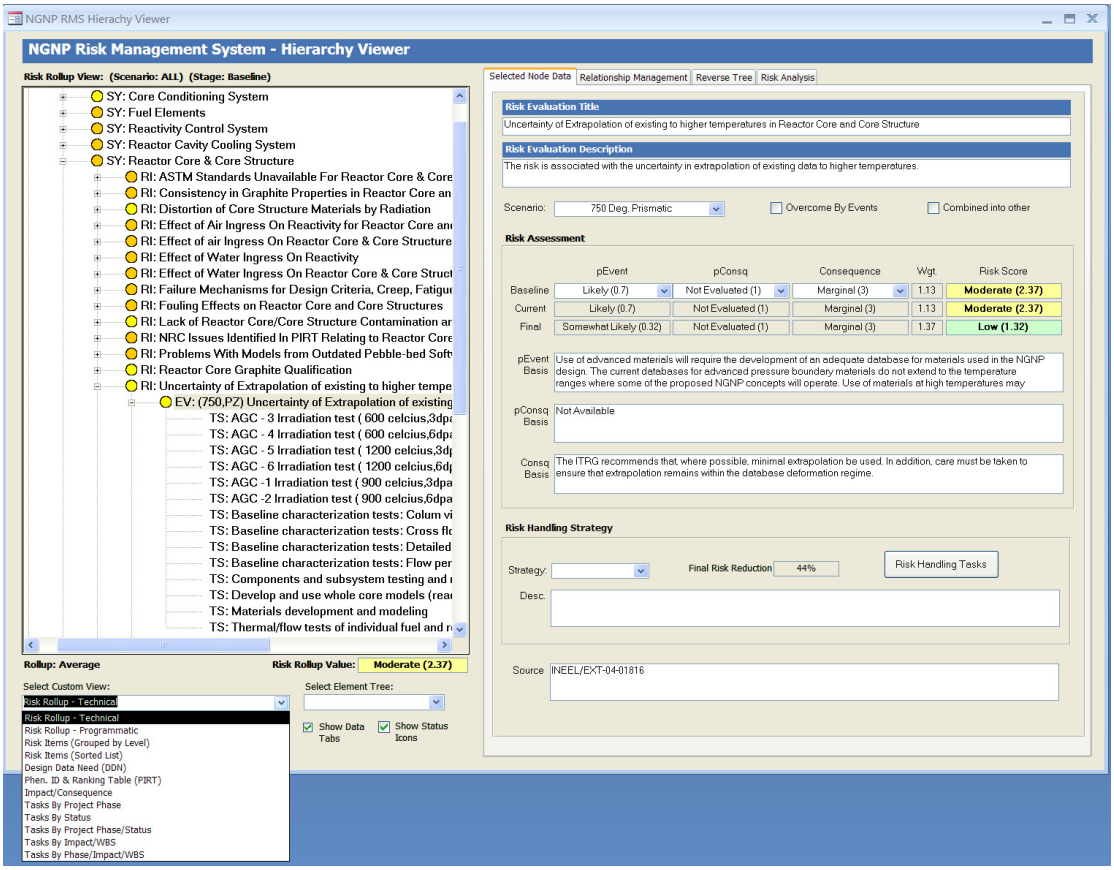


**Figure 1. RMS Hierarchy Viewer**

The RMS provides the capability to outline and status a risk handling strategy for each identified risk. Risk reduction tasks are assigned to each risk item. The magnitude of risk reduction estimated for each associated task can then be specified, as shown in Figure 2. The status of the risk handling strategy is primarily based on the percent completion of risk reduction tasks. The status of the strategy can also be seen graphically in a Risk Waterfall chart that displays the actual/current risk reduction versus the planned risk reduction over time, as shown in Figure 3.

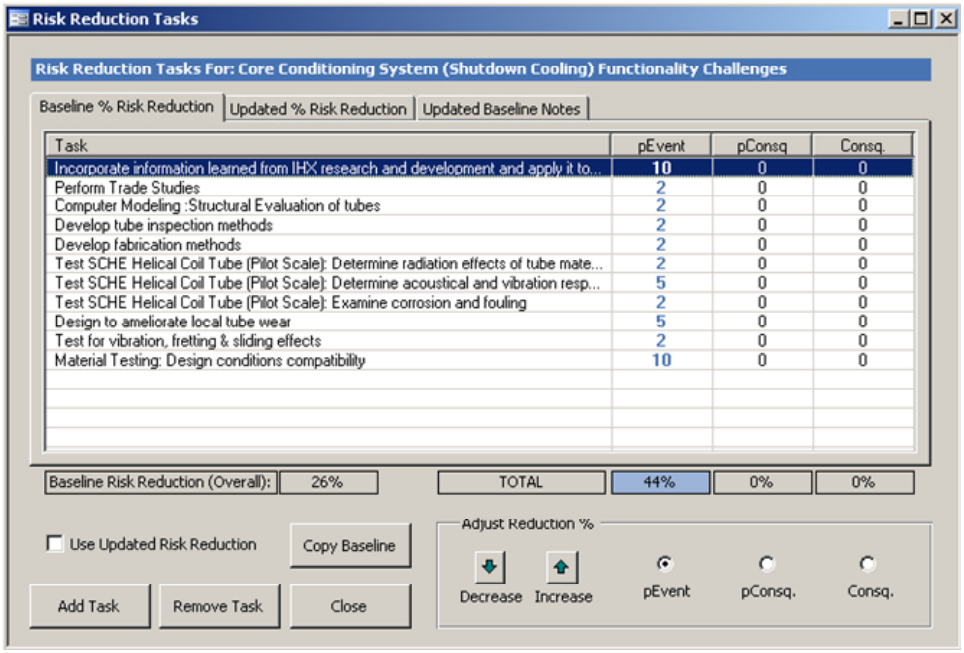


**Figure 2. RMP Risk Reduction Tasks**

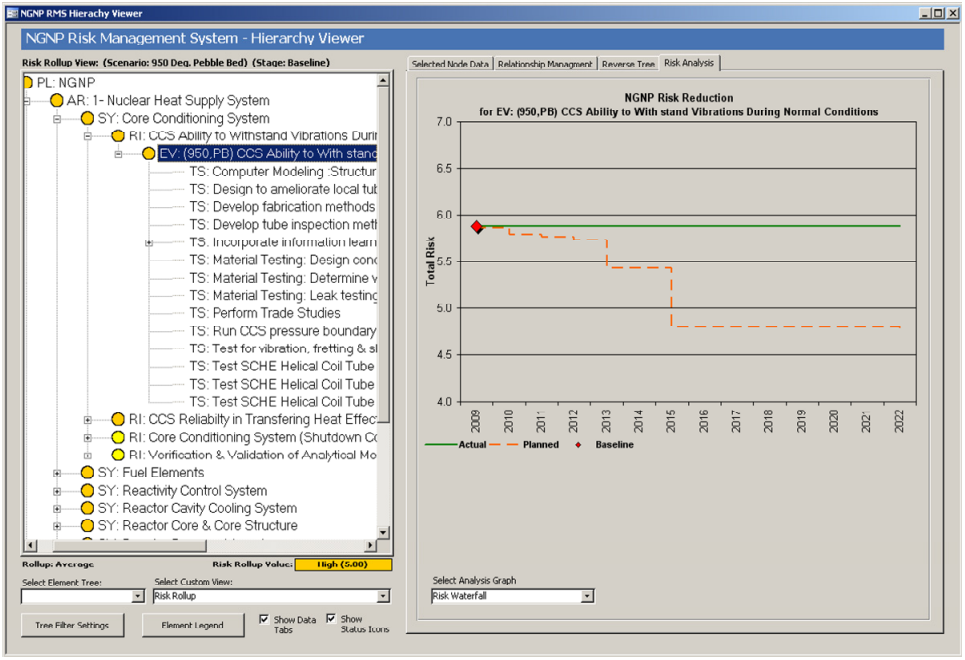


**Figure 3. RMS Hierarchy Viewer**

For tasks that provide a reduction in risk for more than one risk item, the RMS tool provides the ability to summarize the task's contribution across the entire NGNP risk plan. This capability makes it possible to rank order tasks by the magnitude of risk reduction provided for the entire project. This rank ordering of task then provides valuable input into NGNP project planning and prioritization.

Additional RMS functionality includes the ability to analyze and track relational mapping between project risks and PIRTs, risk reduction tasks and DDNs thus facilitating gap identification in planning research and development (R&D) activities.

# 3. Execution Instructions

## 3.1 Introduction

This section provides brief instruction on executing some of the key features of the NGNP RMS. The guide is not comprehensive in nature and assumes that users have a certain level of computer skill/expertise in addition to some minimal subject matter expertise in NGNP Risk Management methodology and techniques. The user is referred to the NGNP Risk Management Plan for details regarding NGNP Risk Management.

## 3.2 Quick Start

This section outlines some simple steps to gain access to primary RMS data views. Subsequent sections will provide more detailed instruction.

- Copy the program file (NGNP Risk Management System V1.mde) directly to your computer.
- Start the program by double clicking the file from Windows File Explorer.
- Select “Browse/Edit Relationship Mappings” from the Main Menu.
- Then select ““Hierarchy Viewer” from the menu.
- Select “Risk Rollup” from the “Select Custom View” drop down menu at the bottom of the screen.
- Select desired parameters from the “Risk View Dialog”, and then click “Show View”.
- Browse the Hierarchy Tree to view data.

## 3.3 System Requirements

The RMS is based on a relational database developed in Microsoft® Access 2003. As such, any computer properly configured to run Microsoft Access® 2003 or higher is adequate to run the RMS. However, be aware that a number of key RMS functions are calculation intensive and older model computers may observe degradation in tool performance.

## 3.4 Program Execution

To start the RMS, copy the program file (NGNP Risk Management System V1.mde) directly to your computer. (The file will not properly execute from a compact disk [CD] or Network Drive.) Then execute the file by either double-clicking the file from Windows File Explorer or by first starting MS Access and then Opening the file directly using MS Access File–Open menu commands. Depending on the version of Access the user may need to grant permissions to run macros and other key program features as the program initiates.

## 3.5 Key Features

### 3.5.1 Hierarchy Viewer

The primary user interface in RMS is the Hierarchy Viewer shown in Figure 4. To access the viewer first select “Browse/Edit Relationship Mappings” from the RMS Main Menu, then select “Hierarchy

Viewer" from the menu. A key feature of the Viewer is the Hierarchy Window (see Figure 4, Item 3) which provides a graphical representation of RMS data elements and their relationships in a tree view. By expanding the tree the user can drill into various levels of detail. Clicking on any node of the tree provides further detail for that node in the Selected Node Data Tab (see Figure 4, Item 2).

The Hierarchy Viewer provides a variety of ways to view NGNP risk management data in Custom Views as described in Section 3.5.2 below.

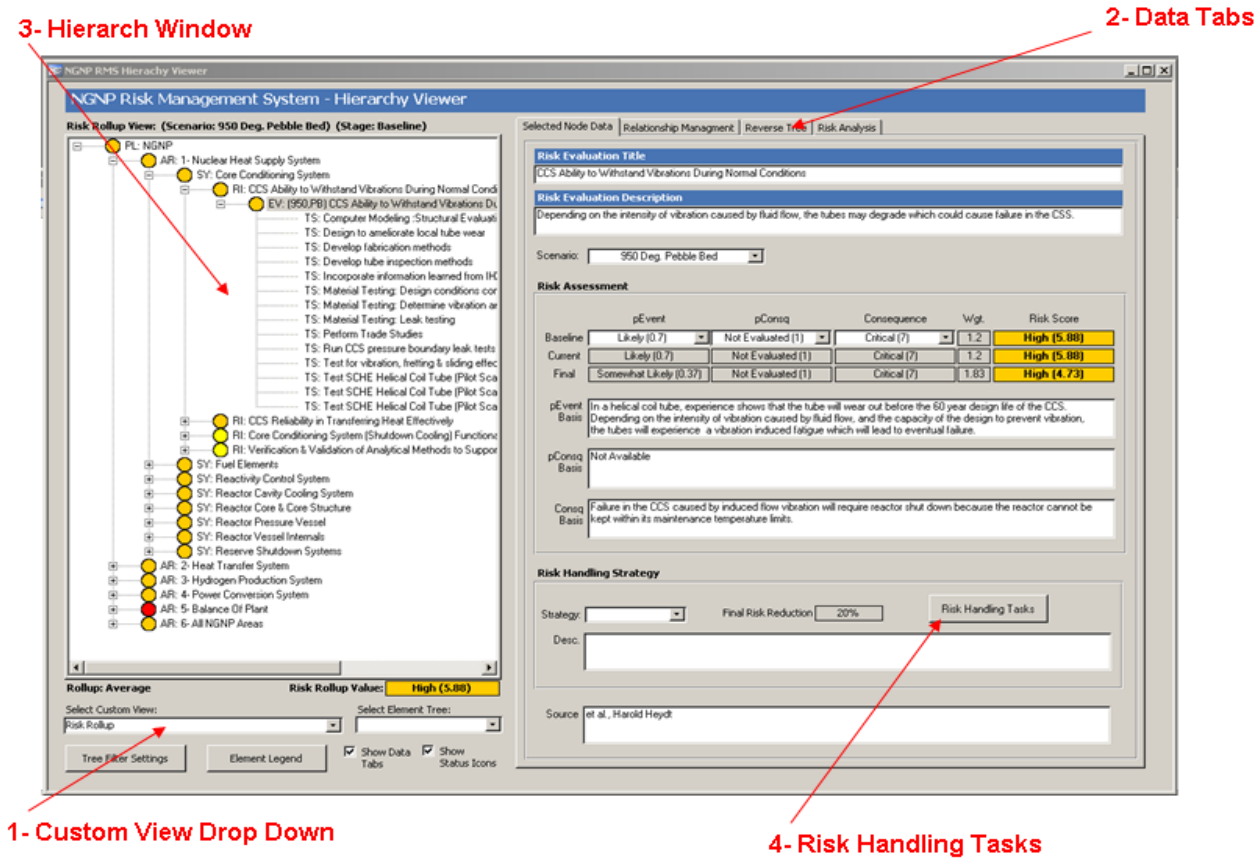


**Figure 4. RMS Hierarchy Viewer**

## 3.5.2 Custom Views

Custom Views provide graphical visualizations of RMS data each tailored for a specific data perspective. To initiate a Custom View select a view from the Custom View drop down menu shown in Figure 4. There are currently five different Custom Views:

- *Risk Rollup* – The risk rollup view is the key RMS data perspective. Selecting this view will first display the Risk View Dialog window (see Figure 5). From this window the user can designate various filters and data view parameters including the Scenario to be viewed, the Risk Values that will be displayed in the Hierarchy Tree and the way the values are rolled up or summarized in the tree from level to level. Once the parameters are chosen click show view to display data in the Viewer. The Dialog window will remain open to allow the user to change parameters as needed. Close the Dialog if not longer required. This view allows the visualization and analyses of the complex relationships between various NGNP data entities (e.g., Critical PASSCs, Risks, Risk Mitigation Tasks, DDNs, and PIRTS). Icons represent a summarization of risk scores at various levels in the Hierarchy. Clicking on/expanding an

Evaluation node displays the Risk Handling Tasks, Baseline Risks Scores, Current Risk Scores, Final Risks Scores, and the bases for the scoring. Clicking the Risk Handling Tasks button (see Figure 4, Item 4) shows the percentage Risk Reduction assigned to each task.

- *Risk Items (Grouped By Level)* – This view groups all applicable risks into Risk Levels and provides a summary count of the risks in each grouping. As with the Risk Rollup the user can browse the associated data by clicking/expanding nodes in the Hierarchy Tree.
- *Risk Items (Sorted)* – This view displays all applicable risks in the Hierarchy Tree sorted alphabetically. As with the Risk Rollup the user can browse the associated data by clicking/expanding nodes in the Hierarchy Tree.
- *Design Data Need (DDN)* – This view displays DDNs in the Hierarchy Tree as mapped to associated Risk Handling Tasks. As with the Risk Rollup the user can browse the associated data by clicking/expanding nodes in the Hierarchy Tree.
- *Phenomena ID & Ranking Table (PIRT)* – This view displays PIRTs in the Hierarchy Tree as mapped to associated NGNP Risks. As with the Risk Rollup the user can browse the associated data by clicking/expanding nodes in the Hierarchy Tree.

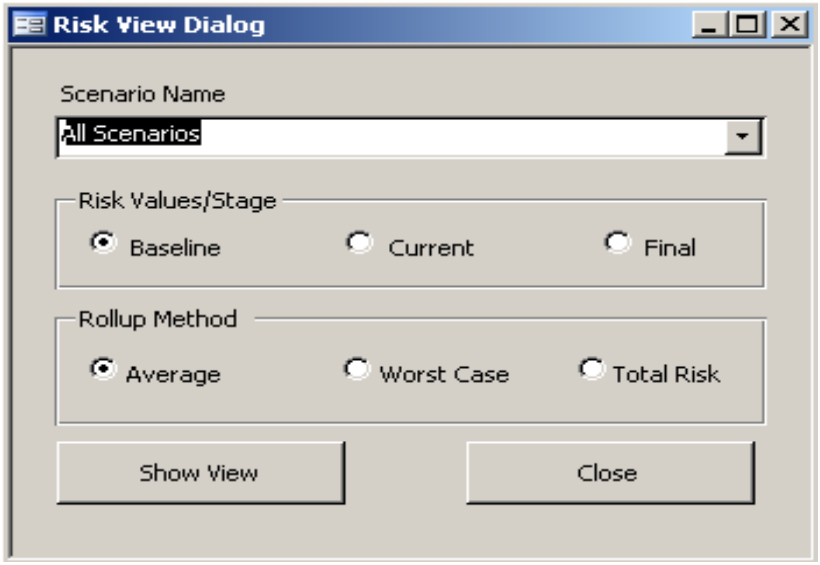


**Figure 5. Risk View Dialog**

### 3.5.3 Reverse Tree

The Reverse Tree provides functionality to view crosscutting data relationships for a particular node. For example, a task may provide risk reduction for a number of different risks while the Hierarchy Window may only display one. To explore multiple data mappings for a particular node select the Reverse Tree tab (see Figure 4, Item 2), then select a node in the Hierarchy Window (see Figure 4, Item 3). The reverse tree will display in the tab. The reverse tree can then be expanded up to the root nodes.

### 3.5.4 Risk Waterfall Graph

The status of the risk reduction strategy can seen graphically in a Risk Waterfall chart that displays the actual/current risk reduction versus the planned risk reduction over time. To display the Risk

Waterfall chart, first generate the Risk Rollup View (if not already generated), then select the Risk Analysis tab (see Figure 4, Item 2), then select the Risk Waterfall item from the Select Analysis Graph drop down list. The Risk Waterfall chart is designed to be interactive with the Risk Rollup View in the Hierarchy Window. Selecting various node items in the tree will change the basis for the chart. Clicking on the top level NGNP node for example will provide a summary risk reduction chart for the entire NGNP Plant. Similarly, selecting an NGNP Area or NGNP System will provide a risk reduction summary for the selected item.

### 3.5.5 Reports

There are a limited number of reports available in the tool. To access these reports select Reports from the Main Menu, then select Risk Management Reports.

### 3.5.6 Other Custom Views

Other custom views are incorporated into the latest version of the RMS. These views—Impact/Consequence, Tasks by Project Phase, Tasks by Status, Tasks by Project Phase/Status, Tasks by Impact/WBS, and Tasks by Phase/Impact/WBS—provide different ways to view the risks data. It should be noted that the data within these views are currently mapped for demonstration purposes and have not be vetted by any of the NGNP subject matter experts or NGNP management team members. Full implementation of these views needs to be populated with data that compiles with the future NGNP project structure. Summaries of the newly implemented custom views appear below.

*Impact/Consequence View* – This view presents data in a set of impacts to the project, the consequences of the impacts, the risks associated with a given consequence, and the tasks assigned to mitigate or reduce the risks. Mapping the impacts may highlight one or more consequences, with each consequence having one or more risks, and each risk having one or more risk reduction tasks assigned.

*Tasks by Project Phase* – This view maps tasks to the various project phases (i.e., pre-conceptual design, conceptual design, preliminary design, final design, construction/system operational testing/readiness declaration, full production, or commercial scale). Each project phase requires execution of tasks to complete each phase. Technology Readiness Levels are inherent to each project phase, and the tasks in each phase advance the project and technology to the next level. Analysis of the tasks to project phases aids in identifying those tasks that advance the project and possibly those tasks that do not contribute to project development and completion.

*Tasks by Status* – Each task within the RMS is to be performed or has been performed over the life cycle of the project. The Task by Status custom view allows users to see status on tasks that are completed, completed late, in process with no issues, require future activity with no issues, not started on time or late start < 30 days, and not started or late > than 30 days. By seeing the status of tasks, users will be able to determine which of the time-driven activities need the most attention and/or may need significant intervention to avoid consequences of not performing the tasks.

*Tasks by Project Phase/Status* – This custom view provides a method to combine the two previous views. Status of tasks within a project phase aids in project risk monitoring. With the embedded status in each project phase, risk managers are able to identify where scheduled activities may need more attention to drive the project to phase completion.

*Tasks by Impact/WBS* – With all risks aligned to specific master schedule activities, the need for viewing risks in terms of impact on the associated WBS item is necessary. This view ties the WBS to the Impact/Consequence hierarch, allowing users to see direct risk impact and consequences to specific master schedule activities.

*Tasks by Phase/Impact/WBS* – By combining the features of project phases, impact/consequence, and WBS views, users are able to see the integration life cycle of risks for the project. Presentation in this view informs users which tasks to perform within which project phase to get the best return on investment, given as a percentage of the task to the overall risk reduction. The hierarchal order of this view is project phase, impact, consequence, WBS activity, then task