Translating the Facilities Information Management System (FIMS) Data into Risk Management Criteria and into a Risk Ranking Process for Disposition Projects – 14135

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ABSTRACT

As a test pilot developed a risk management/prioritization system to prioritize facilities, which are identified as excess to mission needs and ready for disposition, using information/data provided within the Facilities Infrastructure, and Management System (FIMS) Data Base. Scored and prioritized over 6000 facility assets for NNSA using the methodology, prioritized the facility assets and plotted the results as metrics (i.e. risk reduction over time, or risk growth if facilities are not dispositioned).

INTRODUCTION

Risk management is not a new concept, and there are many different ways to perform a risk analysis. Historically it has been challenging to: 1) collect information needed to perform a risk analysis, 2) request from various sites risk ranking of disposition projects and combine the results (since different sites normally use different risk processes and criteria, it is like mixing apples and oranges), 3) ensure that input used is uniform and validated across many different locations.

What is new is this concept of using data from the FIMS to perform a risk analysis. The data provided within the FIMS is not only validated by each submitting Field Office, but also includes extensive facility information which lends itself to a risk scoring.

Because of limited resources, it is vital to decision makers that they understand the significance of decisions in funding or not funding a disposition project versus funding life extension projects to ensure that contamination is contained within designed parameters. Examples of life extension projects include: roof replacements; structural reinforcements; environmental permits; and surveillance and maintenance activities that have been required by DOE Directives and environmental regulations.

The advantage of using the FIMS data base incorporates the use of various data fields for over 6,000 facilities, all of which is captured within the FIMS data base. The product results in quantifying the FIMS data into a single score risk score for each facility. This effort is a test pilot, which if successful could be used by the Facilities Disposition Program (FDP), and implemented for all of the NNSA Field Offices. Creation of this risk methodology requires knowledge of: project management (for disposition projects); environmental regulations; Department of Energy directives; the FIMS data base and data; operational concepts of a facility; applicable safety and health laws and requirements; and the basics of building construct. It is expected that subjective interpretations will be made regarding the data used from FIMS, and these interpretations should be documented as assumptions. [1]Microsoft® Excel™ 2007 and Access™ 2007 will be used as necessary to consolidate the data, prepare the analysis, and provide the results.

DESCRIPTION

A simple project schedule was prepared to develop the process. The process was completed in a period of approximately 6 weeks. The schedule involved the four following parts.

- Part 1 – Identification of applicable criteria
- Part 2 - Document criteria and establish a risk scoring matrix
- Part 3 - Calculating results
- Part 4 - The results

To enable the completion of risk management process two interns with the US Department of Energy, Office of Legacy Management provided assistance. With the guidance of a mentor the interns provided invaluable assistance in assembling a workbook within [2]Microsoft® Excel™ 2007, learned how to prepare "IF Statements" and writing Visual Basic statements and sorting thru the establishment of the criteria created by thru the use of the FIMS data.

DISCUSSION

Prior to initiating any effort the team prepared a simple project schedule (which identified four major steps), and criteria for the final product. In addition to the project schedule a few discussions with the team were provided to enable them the knowledge associated with NNSA, NNSA Excess Facilities and other issues relevant to the Facilities Disposition Program.

Part 1 – Identification of applicable criteria

Part 1 of the risk management process involved many discussions over the data collected within the FIMS data base. The discussions centered on the data, terms, definitions of the data collected in the FIMS data base. The basis for the discussions was the FIMS Data Element Dictionary. There are many terms within the FIMS Data Element Dictionary. The following steps were established to ensure a comprehensive approach was used to identify applicable criteria from the FIMS Data Element Dictionary was reviewed and applicable data was selected to prepare a risk scoring matrix.

- Become familiar and gain understanding of facility Assets terms and data.
- Use the FIMS Data Element Dictionary to learn the terms and their meanings of data within FIMS.
- Identify FIMS terms which are applicable to risk decisions.
- Determine how the selected terms could be used for ranking risks.
- List the pros and cons of the terms used which were selected.
- Convert terms into a quantitative score.
- Categorize the terms into related areas (Super Categories).

From the FIMS Data Element Dictionary several data elements were selected as being applicable to scoring risk for facilities which are awaiting disposition. Those data elements were grouped into Super Categories. The Super Categories were Cost, Externalities (Deterioration hazards and Resource Breakdown), and Indexes. The selected Data Elements and Super Categories included:

- Cost
  - Total Operating Cost
  - Annual Actual Maintenance

  - Annual Required Maintenance
  - Deferred Maintenance
  - Replacement Value (RPV)

- Externalities
  - Year Build and Estimated Disposition Year
  - Summary Condition
  - Utilization
  - Hazard Category
  - Deficiency System
  - Seismic Exemption
  - Model Building Type
  - Asset Type
  - No. of Floors
  - Gross Square Foot (Sqft.)
  - Status
  - Planned Compliance Year
  - Mission Dependency
  - Excess Indicator (Expressed as either a "Yes" or "No" in FIMS, a "Yes" indicates facility has been declared excess to mission needs)

- Indexes
  - Asset Condition Index
  - Facility Condition Index
  - Operations Cost Index

At the conclusion of Part 1, the applicable data was selected, discussions regarding standard quantitative scoring methods for risk management were explored and discussed, the selected data was categorized into super categories, and data represented in FIMS was prepared in the Excel™ 2007 workbook to enable the conversion of the data into a quantitative score. The team then proceeded to prepare a risk scoring matrix and methodology.

Part 2 – Document criteria and establish risk scoring matrix

Part 2 of the process involved the most discussion and decisions. The decisions and discussions centered around the task of taking terms selected for use and converting the terms into a score. Scoring notes were documented. It was also decided that each term which was selected for use would be scored by use of a traditional Low, Medium, and High score. A value of 1 is used for a low risk, 2 for a medium risk, and 3 for a high risk. In addition, and because certain terms could possibly carry more risk than other terms it was decided to use a weighed value (the sum of the weighed values is equal to 100), the more important the term the more weight provided.

As an example of this methodology, consider the term "Hazard Category", within the FIMS Data Element Dictionary, there are ten different categories by which a facility can be identified within FIMS and binned within the Low, Medium, and High Score. In the discussion it was decided that the categories would be binned as follows:

- Low Score - 1
  - Not Applicable

- Medium Score – 2
  - Radiological Facility
  - Chemical Hazard Facility
  - Radiological Facility and Chemical Hazard Facility

- High Score – 3
  - Nuclear Facility Category 1
  - Nuclear Facility Category 2
  - Nuclear Facility Category 3
  - Nuclear Category 1 and Chemical Hazard Facility
  - Nuclear Category 2 and Chemical Hazard Facility
  - Nuclear Category 3 and Chemical Hazard Facility

The weight assumed for the term "Hazard Category" was six, as safety and health and adhering to approved 10CFR180 regulations is a high priority.

Another example of how terms were converted into the risk scoring matrix included a basic calculation of thirds. Take for example the term "Deferred Maintenance". In this example, the data represented by the facility population was reviewed, the highest cost for deferred maintenance was identified for a particular facility, that cost was then divided by three and ranges were populated into the Low, Medium, and High scoring categories:

- Low range: $0 - $29,312,275
- Medium range: $29,312,276 - $58,624,549
- High range: $58,624,550 - $87,936,824

The weight assumed for the term "Deferred Maintenance" was five; the discussion for the weight entailed how the rise in the cost over time by not removing the facility could jeopardize other mission needs by taking funding away from other mission priorities.

A third example of translating the terms into scores was "Model Building Type", in this example it was a bit more of a challenge to derive a score in that the discussions had to prevail along the lines of making assumptions regarding building construct and the particular hazards that may be represented by the construct material of the building. In this example, for instance the FIMS data entry for a building code indicated that the construct of the building was wood, then the facility would receive a 3 (High Risk, due to the possibility of combustibility). If the building code entered in FIMS indicated that the construct was concrete then the facility would receive a 1 (Low Risk, due to the low possibility of combustibility). Fig. 1- Translate from FIMS into Risk Categories, and Fig. 2 – Quantifying the FIMS Criteria as High, Medium, Low Risk, below illustrates how the FIMS terms were translated into risk categories and scores, and then multiplied by the weighed number to derive a score.

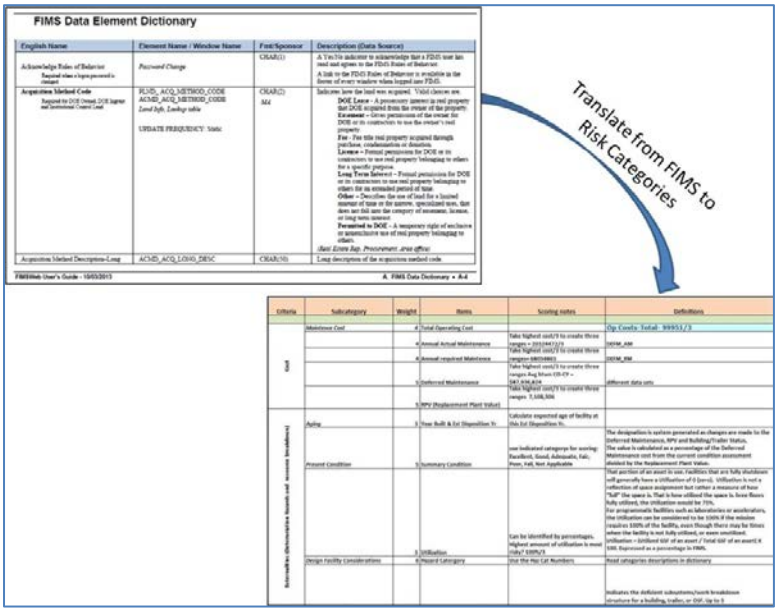

Fig. 1 – Translate from FIMS to Risk Categories

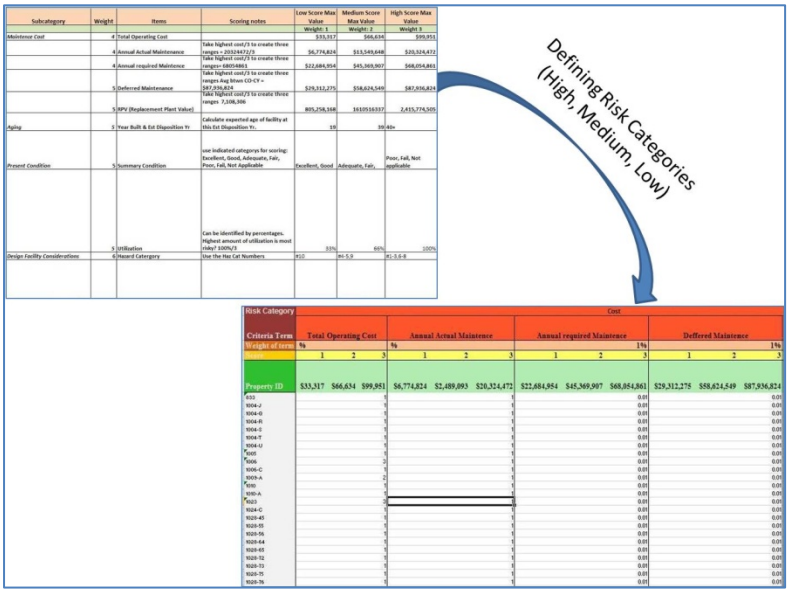

Fig. 2 Quantifying the FIMS Criteria as High, Medium, Low Risk

As in most risk prioritization processes criteria is established and as part of the scoring process the emphasis is provided each criteria thru the use of a multiplier, a weight. The more important the criteria the higher the weight assigned to the criteria. For this test pilot, both the criteria and the assigned weighted factors are shown below in Fig. 3 – Assigning Weighted Factors. The distribution across the super categories of the weighted criteria is shown in Fig. 4 – Validating Weighted by Category Sums, the purpose of summing the weights and looking at the super categories is to ensure that appropriate emphasis

is provided to the sum of the categories. In this test pilot, the overall cost criteria was weighted 22%, the Externalities was weighted 69% and the Indexes was weighted 9%.

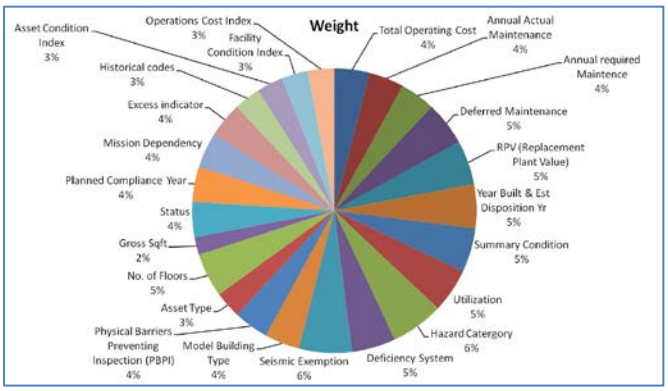

Fig. 3 - Assigning Weighted Factors

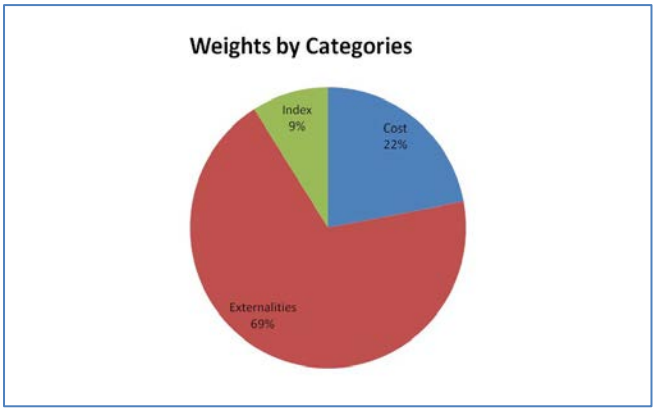

Fig. 4 - Validating Weighed by Category Sums

Part 3 – Calculate results

In Part 3 of the process, a report was exported from the FIMS data base into a [3]Microsoft® Excel™ 2007 Workbook. The data used included the data from which were defined as part of the risk process in Part 1 of the process. Using data from the FIMS data base has several advantages, which include: 1) FIMS data is validated by the respective Field Offices, 2) FIMS data is updated at a minimum on an annual basis, 3) Data collection for purposes of performing a risk analysis is not necessary (i.e. the collection of site data is normally time consuming and cumbersome), and 3) Data fields in FIMS are defined and definitions are universal across the many users of the FIMS data base.

Once the data reported down from the FIMS data base the team used [a]Microsoft® Excel™ 2007 and visual basic language to prepare "IF" statements to sort thru thousands of data sets, criteria decisions,

possible combinations, and automated the score calculations (including multiplying by a weighted factor). An example of an "IF" statement and the resulting score is show in Fig. 5 – Scoring, Assigning Weights, and Calculating Data. In Fig. 5, the "IF" statement shown is for deriving a score for a High Risk, using the definitions discussed in the category of Hazard Category.

Similar "IF" statements were prepared for all the terms which were identified as criteria. Once all the "IF" statements were prepared, and all of the over 20,000 facilities and FIMS data was populated into the Excel™ 2007 Workbook for each of the corresponding rows the analysis was performed and the results were then derived.

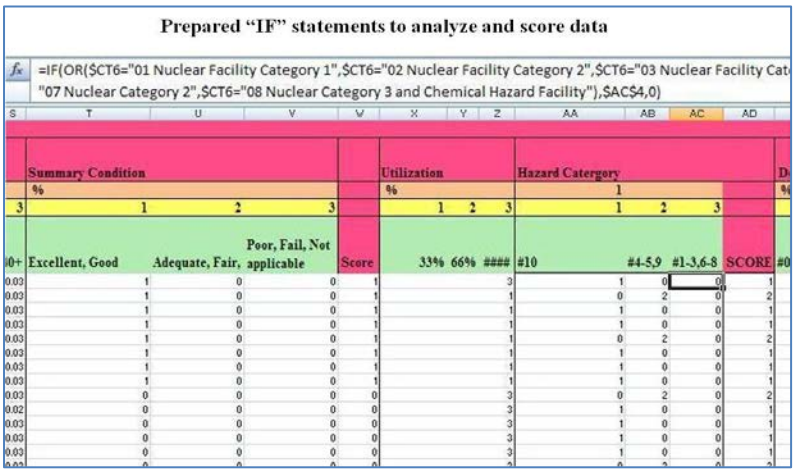

Fig. 5 – Scoring, Assigning Weights, and Calculating Data

Part 4 – The results

Part 4 shows a portion of the results derived from the documented methodology and calculations performed within the Excel™ 2007 Workbook. Prior to preparing the results the team discussed and created expectations of what meaningful results could be provided from the test pilot. The following criteria were decided for purposes of calculating results:

- Create a graphical representation of the final score by facilities.
- Ranking each facility by each risk score.
- Show total risk scored and the reduction of risk as facilities are eliminated (i.e. a metric)

The process was automated using basic [a]Microsoft® Office Excel™ 2007; the results of the risk of leaving each facility in place are both numerically and graphically represented as a listing of facilities and the corresponding risk. The risk was prioritized as an entire list, or by the year that the facility is planned to be excess to mission needs. In addition, the facilities and corresponding risk can be summed and a metric created which shows how the overall risk represented by all the facilities included in the analysis can be reduced over time, assuming the facilities are dispositioned in the year they become available as excess to mission need.

The test pilot provides the NNSA, Office of Infrastructure and Capital Planning, with the ability to document risk associated with structures and facilities which are excess to mission needs. It also enables the NNSA with the ability to observe changes in risk as the facilities remain in place and as disposition is not completed by the estimated disposition dates.

Fig. 6 – Risk Reduction by Fiscal Year, displays the total risk represented by all the facilities which were analyzed in the test pilot, and the reduction of this risk over time assuming that the facilities are dispositioned in the year that they are declared excess to mission need.

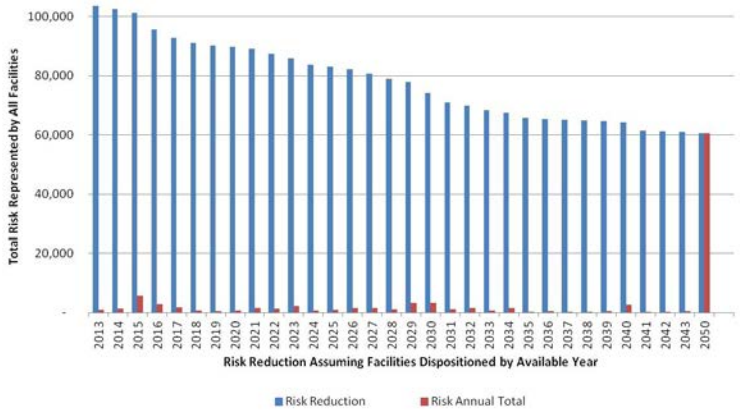

Fig. 6 - Risk Reduction by Fiscal Year

Fig. 7 – Risk Score of Facilities in Fiscal Year 2020 depicts the calculated risk score for each facility which is currently identified in FIMS as planned for being excess to mission need in the Fiscal Year 2020. The test pilot was successful in calculating and depicting such information for all of the populated facilities (6,000 plus).

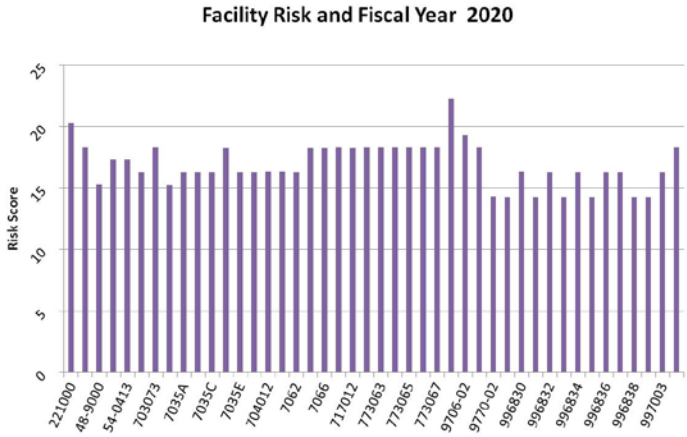

Fig. 7 - Risk Score of Facilities in Fiscal Year 2020

Fig. 8 – Prioritizing Facilities by Score and Estimated Disposition Date depicts a very small sample population taken from the Excel™ 2007 Workbook of the facility, the associated calculated risk score, and estimated disposition year. The facilities are prioritized by the risk score within the year that the facility is currently planned for disposition.

Property ID	Risk Score	Est Disposition Yr
739004	16.33	2025
9213	16.3	2025
183002	16.29	2025
741001	16.29	2025
183005	16.28	2025
11-017A	16.28	2025
XF1303	16.28	2025
608000	16.27	2025
711005	16.27	2025
9770-07	16.26	2025
9703-14	14.29	2025
12-R-040	14.27	2025
12-R-056	14.27	2025
151002	14.26	2025
151001	14.25	2025
772000	24.3	2026
254013	22.26	2026
3038	21.34	2026
281006	20.33	2026
281004	20.32	2026
618000	20.31	2026
772007	20.31	2026
789000	20.31	2026
12-005	20.3	2026
12-006	20.3	2026
12-101	20.3	2026
12-102	20.3	2026

Fig. 8 - Prioritizing Facilities by Score and Estimated Disposition Date

CONCLUSSIONS

In conclusion, the test pilot of taking FIMS data and translating the FIMS data into quantifiable criteria which could be used to derive a risk score provided favorable results. The results of the test pilot were compared to a priority list which was derived by each of the respective Field Offices, and although each Field Office used different methodologies in deriving their risk scores there were very close correlations between the two methods.

This methodology provides a tool to foster decisions regarding which facilities present a higher risk for purposes of applying limited funding resources to remove the structure, not only at a site level, but at a national programmatic level.

The test pilot was successful in ensuring that each asset in FIMS has a risk score and disposition projects can be prioritized, reduction of risk can be displayed as facilities are dispositioned, risk can be assessed for each asset (facility/structure) in FIMS, and funding decisions can be informed with the use of this risk prioritization tool. This risk analysis process provides a uniform scoring process across various sites, and can be done by downloading information from the FIMS database then importing the data into the Excel™ 2007 workbook.

Future possibilities

Because the FIMS data is used by all Federal Agencies to manage assets, this methodology may also be used by others within the US Department of Energy, as well as by other Federal Agencies external to the US Department of Energy. Future extrapolations of this effort or expansion of this test pilot could be used to accomplish the following:

- Demonstrate valuable investment for demolition based on risk (i.e. eliminate high risk scoring facilities first).
- Establish risk relationship to cost of disposition.
- Possible advancement of a Nation-Wide use of existing FIMS data to calculate a risk scores for those facilities excess to assigned mission.

Footnotes:

[a] *Microsoft® Exel™ 2007 and Access™ 2007 are a trademark of the Microsoft Corporation in the United States and/or other countries.*

REFERENCES

1, Facilities Information Management System (FIMS) Data Element Dictionary - FIMSWeb User's Guide, 10/3/2013, A. FIMS Data Dictionary

2. Microsoft® Excel™ 2007

3. Microsoft® Access™ 2007

ACKNOWLEDGEMENTS

In support of the test pilot an opportunity to acquire two outstanding interns who were assigned to the US Department of Legacy Management, and looking for an opportunity to do some different work within the US Department of Energy. At the request of their assigned to Office they were allowed to work for the NNSA under my mentorship. These two individuals: Felecia Cummings, Student Intern, Kansas City, Mo, and Jazmin Locke, Student Intern, Miami, FL provided invaluable support in preparing working through development of the criteria, researching information to support selection of the criteria used, and applying their knowledge and skills to advance the effort through completion. They worked diligently to ensure the effort was completed prior to departing their internship, and thus I thank them for all of their hard work and devotion to this test pilot.

In addition, a big "thank you" to my supervisor, Jeff Underwood, National Nuclear Security Administration Director, Office of Infrastructure & Capital Planning (NA-00-20), for enabling the use of the Interns to develop this effort.