Remote Monitoring System Design Requirements for Accountable Nuclear Materials at the Nevada National Security Site

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Introduction

► Nuclear Material requires staging to support retrieval for programmatic use

- Storage Vault (lockers) for more frequent retrieval

- Shipping or Staging Packages may be acceptable or desirable

- To support staging hundreds of packages, deployment of a remote monitoring system is desired

RMS Process

► DOE Team

■ NNSS

■ SNL

■ SRNL

■ ANL

► The Problem

■ Extend physical inventory intervals

RMS Other Drivers

► Other Drivers

- Reduce operational costs
- Minimize personnel radiation exposure
- Environmental monitoring for condition-based maintenance
- Enhanced safeguards and security

► RMS will enable the potential for

- Extending physical inventory surveillance intervals
- Extending maintenance service intervals for Type B packaging
- Enhanced tamper detection and reporting

RMS Objectives

1. Continuous monitoring of packaging (containers)
2. Remote access and display of alarms
3. Cyber protection
4. Secure archive/inspection of recorded system data
5. Flexible network communication architecture
6. Automated analysis and creation of reports
7. Intentional design features to facilitate potential integration with surrounding physical security systems

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Team Conclusions

► 291 discrete functional requirements

► Assembled into 27 Groups

► Requirements may be used

  ■ To develop an integrated conceptual design

  ■ In a modular fashion to inform separate designs

Example Requirements Discussion

► 1st RMS Objective: provide continuous monitoring of packaging (containers) to meet MC&A inventory requirements

- **Functional Requirement TS-1**: The packaging tamper detection system shall detect unauthorized opening of safeguarded package containment access covers/lids within authorized storage locations
- **Group**: Tamper Detection System
- **Threshold**: detect 98% unauthorized open events
- **Objective**: detect 99% of events
- **Rationale** includes Tamper Definition and Tamper Detection Definition

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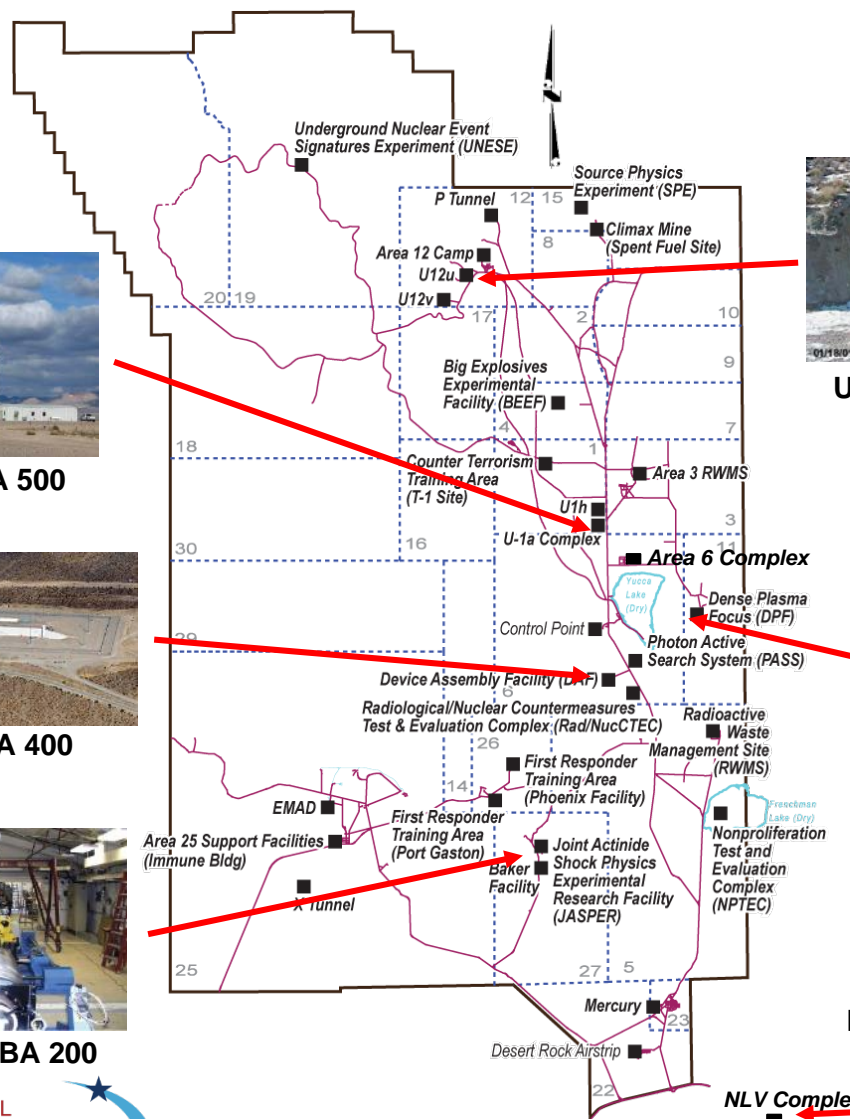*National Security Technologies,* LLC

Example Requirements Discussion

► 4th RMS Objective: provide secure archive and inspection of recorded system data

- **Functional Requirement VS-15**: The video surveillance system data server shall store required digital video streams from each camera to meet threshold storage time periods
- **Group**: Video Surveillance System
- **Threshold**: storage for more than one year
- **Objective**: storage for more than three years
- **Rationale** includes compliance with National Archives and Records Administration (NARA) requirements

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Example Requirements Discussion

► 5th RMS Objective: provide flexible network communication architecture supporting communications between packaging and monitoring locations

- **Functional Requirement VS-20**: The video surveillance system shall stream content to the building communications interface unit
- **Group**: Video Surveillance System
- **Threshold**: must be provided
- **Objective**: none
- **Rationale** is this function is a basic system requirement

NNSS and Outlying NM Storage Locations

RSL – Andrews – MBA 8

U12U – MBA 12U

U1a – MBA 500

DAF – MBA 400

JASPER – MBA 200

DPF – MBA 11-102

STL – Santa Barbara – MBAs 9/9A

Bldg. A-1 MBAs 10 & 11

RSL – Nellis – MBA 7

Map labels: Underground Nuclear Event Signatures Experiment (UNESE); Source Physics Experiment (SPE); P Tunnel; Climax Mine (Spent Fuel Site); Area 12 Camp; U12u; U12v; Big Explosives Experimental Facility (BEEF); Counter Terrorism Training Area (T-1 Site); Area 3 RWMS; U1h; U-1a Complex; Area 6 Complex; Dense Plasma Focus (DPF); Control Point; Photon Active Search System (PASS); Device Assembly Facility (DAF); Radiological/Nuclear Countermeasures Test & Evaluation Complex (Rad/NucCTEC); Radioactive Waste Management Site (RWMS); EMAD; First Responder Training Area (Phoenix Facility); Area 25 Support Facilities (Immune Bldg); First Responder Training Area (Port Gaston); Baker Facility; Joint Actinide Shock Physics Experimental Research Facility (JASPER); Nonproliferation Test and Evaluation Complex (NPTEC); X-Tunnel; Mercury; Desert Rock Airstrip; NLV Complex

Intended Usage

► NNSS holdings include more than twenty remote/geographically-separated material staging locations

► Project team intends to employ some or all requirements while developing and implementing enhanced staging solutions for the NNSS

Summary

►NNSS identified a need to extend the physical inventory surveillance interval for staged material. A team developed a comprehensive set of functional requirements to meet the objectives of a Remote Monitoring System.

1. Continuous monitoring of packaging (containers)
2. Remote access and display of alarms
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