

Transport Security – Security of Spent Nuclear Fuel in Transport and Dry Storage

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World Institute for Nuclear Security
Workshop on Security of Dry Storage
of Spent Nuclear Fuel

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Outline

- International Security for Transport and Storage of Spent Nuclear Fuel (SNF)
 - The CPPNM, its Amendment and Basis for Security Measures
 - The role of INFCIRC/225/Rev. 5 (Nuclear Security Series No. 13)
 - Example security measures for SNF in Transport
 - Example security measures for SNF in Dry Storage

- WINS Transport Security Documents

- Developing Electronic Technologies for Enhancing Transport and Storage Security (based on work developed by Argonne National Laboratory)
 - ARG-US RFID: tracking and monitoring nuclear materials in transport and storage
 - Managing Aging Effects on Dry Cask Storage Systems
 - ARG-US Remote Area Modular Monitoring (RAMM) for Dry Cask Storage

Primary Basis for International Security Requirements – The CPPNM

➤ Convention on Physical Protection of Nuclear Material (CPPNM)

- Opened for signature 3 March 1980
- Depository is the IAEA
- 149 State Parties (as of 17 December 2013)
- Applies to nuclear material used for peaceful purposes
 - while in domestic storage
 - while in international storage incidental to transport
 - while in international nuclear transport
- Security measures are based on categories
- Categorizes Nuclear Material (Cat. I, II and III), established in Annex II
- SNF is categorized as Cat. II
- However according to footnote d of Annex II:

“Although this level of protection is recommended, it would be open to States, upon evaluation of the specific circumstances, to assign a different category of physical protection”

CPPNM Requirements

- SNF while in domestic storage:
 - No responsibility to provide information relative to an offence involving domestic SNF storage
- SNF while in storage incidental to international transport:
 - To be stored under constant surveillance by guards or electronic devices
 - To be surrounded by physical barrier with limited number of entry points, and under appropriate control
- SNF while in international nuclear transport
 - Prior arrangements among sender, receiver, and carrier
 - Prior agreement between natural or legal persons specifying time, place and procedures for transferring transport responsibility
- NOTE: if a State categorizes SNF as Cat. I, additional security requirements will apply such as ensuring when SNF is in international transport that it is
“...under constant surveillance by escorts and under conditions which assure close communication with appropriate response forces”



Amendment to the CPPNM

- Adopted at conference 8 July 2005
- 75 State Parties (as of 22 April 2014)
- Will enter into force when 2/3rd of the Parties to the CPPNM (i.e. 99 States) have deposited instruments of ratification
- Changes include:
 - Changes Convention title – added “and Nuclear Facilities” (includes storage)
 - Adds protecting against “sabotage” as one purpose of the Convention
 - Adds 12 Fundamental Principles that apply
 - Adds requirements for a physical protection regime for storage and transport – both domestic and international
 - Adds specific requirements for transport and storage, both domestic and international
- Maintains same requirements for categorizing nuclear material, including SNF

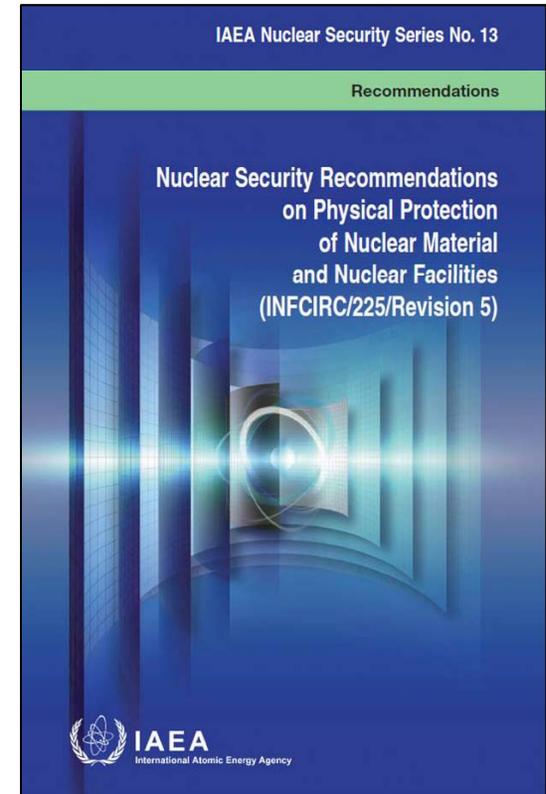


Additional Requirements from the Amendment to the CPPNM

- SNF while in domestic storage:
 - Establish, implement and maintain physical protection regime to protect against theft and other unlawful taking of nuclear material
 - States consult internationally on design, maintenance and improvement of physical protection of nuclear material in domestic storage
- SNF while in storage incidental to domestic & international transport:
 - Establish, implement and maintain physical protection regime to protect against theft and other unlawful taking of nuclear material
- SNF while in international transport
 - State responsible to ensure adequate protection until such responsibility is appropriately transferred to another State
 - State to establish and maintain legislative and regulatory framework to govern physical protection, including inspections
- SNF while in domestic transport
 - State to establish and maintain legislative and regulatory framework to govern physical protection, including inspections
 - States consult internationally on design, maintenance and improvement of physical protection of nuclear material in domestic transport

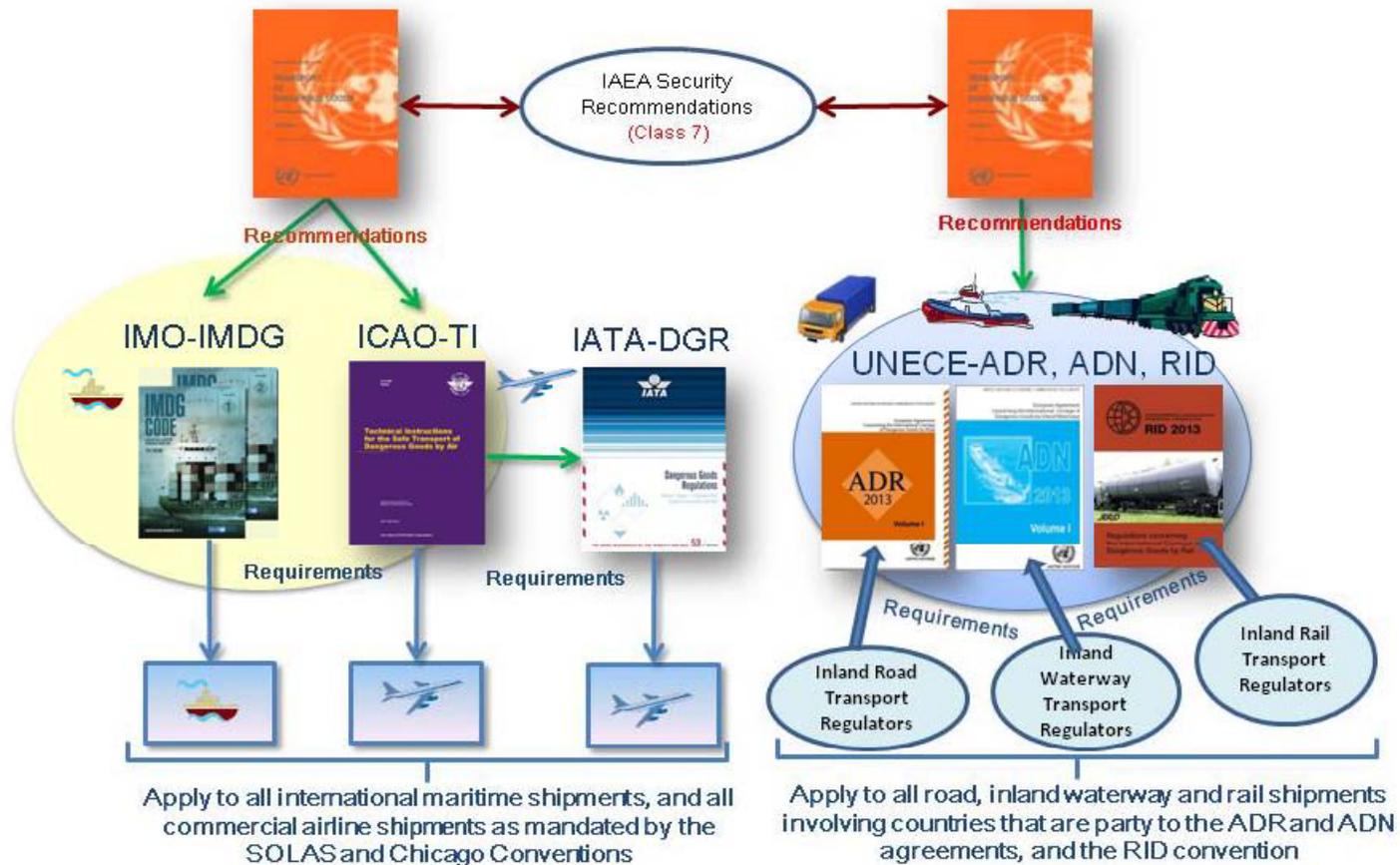
Recommendations for Security

- INFCIRC/225/Rev. 5 (NSS13): published in 2011
- Reflects requirements from the Amendment to the CPPNM
- Provides recommended requirements to
 - Achieve 4 physical protection objectives
 - Apply the 12 Fundamental Principles
 - Protect against both unauthorized removal and sabotage
- Provides requirements, following the CPPNM graded Approach
 - Both unauthorized removal and sabotage
 - Domestic and international transport and storage incidental to transport
 - Domestic storage



Is INFCIRC/225/Rev.5 (NSS13) Legally Binding?

- For storage, no legally-binding international instrument; remains recommendations
- For transport, will probably become binding for most countries in near future through international “Modal” regulations



Example Security Measures for SNF in Transport

- For protection against unauthorized removal (NSS13, paras 6.1-6.31)
 - Use passive and active physical protection measures
 - When stopped, measures equivalent to that for storage
 - For open vehicles, tied down and secured
 - Surveillance of cargo / conveyance
 - Use armed guards to extent permitted by State laws and regulations
 - Continuous, two-way communication between conveyance, guards, response forces, shipper, receiver
- In addition, for protection against sabotage, addressing potential radiological concerns (NSS13, paras 6.60-6.73)
 - Carrier notify shipper, competent authority, response forces of sabotage or attempted sabotage
- If a State categorizes SNF as Cat. I (NSS13, paras 6.32-6.43)
 - Transport control centre, track shipment, monitor security status, secure two-way communications
- Many additional measures specified in NSS13

Example Security Measures for SNF in Storage

- For protection against unauthorized removal (NSS13, paras 4.9-4.35)
 - Store in protected area, inside a limited access area, including
 - Physical barrier
 - Intrusion detection and assessment, including minimal access points, secured with alarms
 - Contingency plans to counter malicious acts and provide appropriate response
 - Permanently staffed central alarm station
 - Dedicated, redundant, secure and diverse transmission/communication systems
 - Treat on-site movements between protected areas in compliance with requirements for transport
- In addition, for protection against sabotage, addressing potential radiological concerns (NSS13, paras 5.20-5.42)
 - Store in protected area, inside a limited access area; establish “vital areas” providing delay mechanisms, including provisions for
 - Timely detection whenever persons are present in vital areas
 - Timely detection of tampering or interference
- Many additional measures specified in NSS13

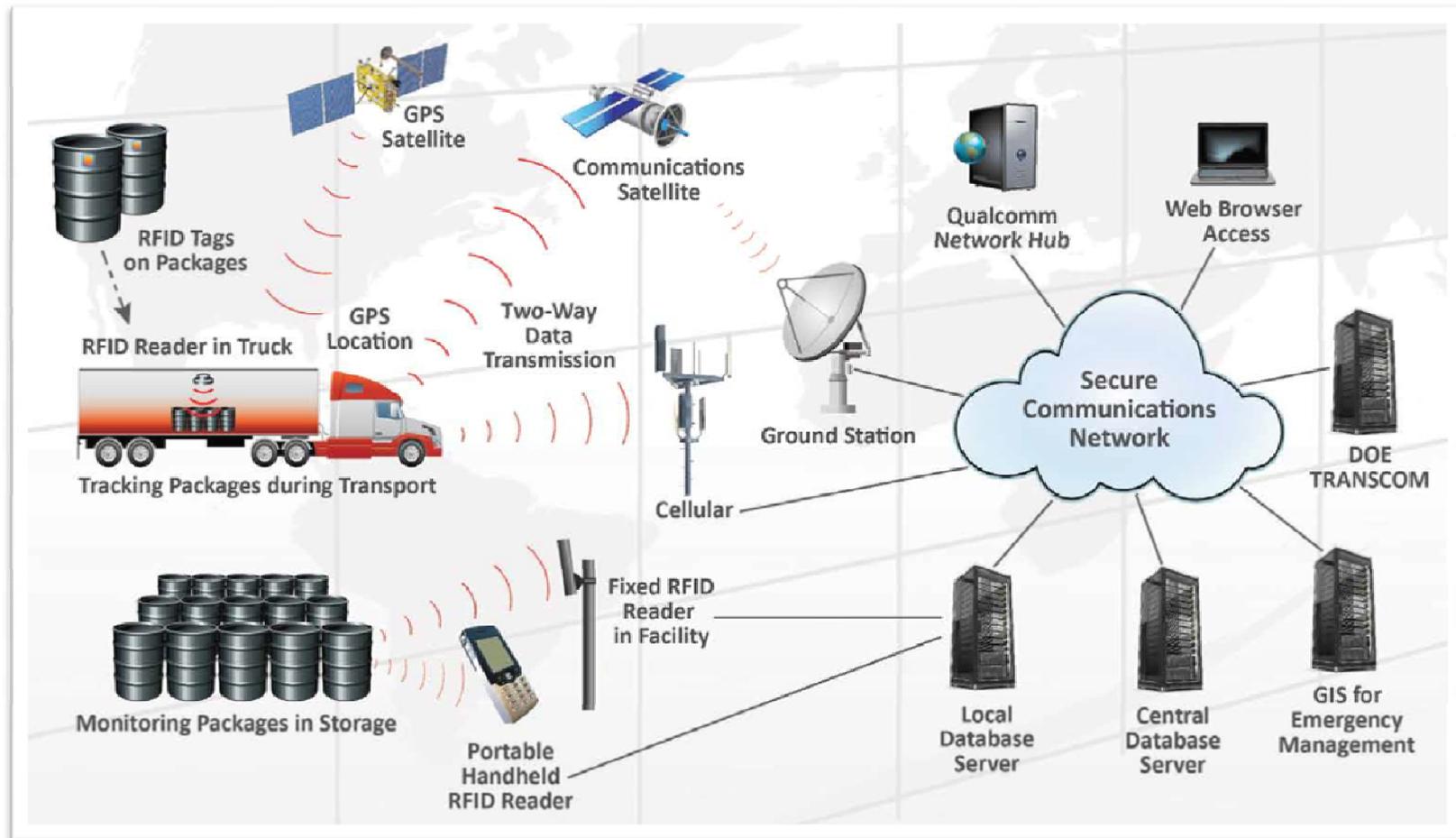


WINS Documents on Transport Security

- QUESTION: How can a security system provide (a) timely detection; (b) active physical protection measures; (c) surveillance of cargo/conveyance; and (d) detection of unauthorized removal, sabotage or attempted sabotage?
 - **WINS Best Practice Guide 4.8 – Electronic Tracking, benefits include**
 - Near real-time, two-way communication
 - Instant and automatic alert/alarm notification, decreased response times
 - Enhanced incident response and emergency management capabilities, provides exact location of shipment
 - Efficient and cost-effective
 - **WINS Case Study – The ARG-US RFID System provides**
 - Continuous tracking and monitoring of packages during transport
 - Battery-powered tags / reader / cellular-satellite network
 - Application programming interface software
 - Secured database servers
 - Storage and transport web applications.
 - **WINS Best Practice Guide 4.10 – Nuclear Transport Security, includes guidance on**
 - Monitoring and tracking
 - Command and control



ARG-US “Watchful Guardian” Radio Frequency Identification (RFID) for tracking and monitoring nuclear materials in transport and storage

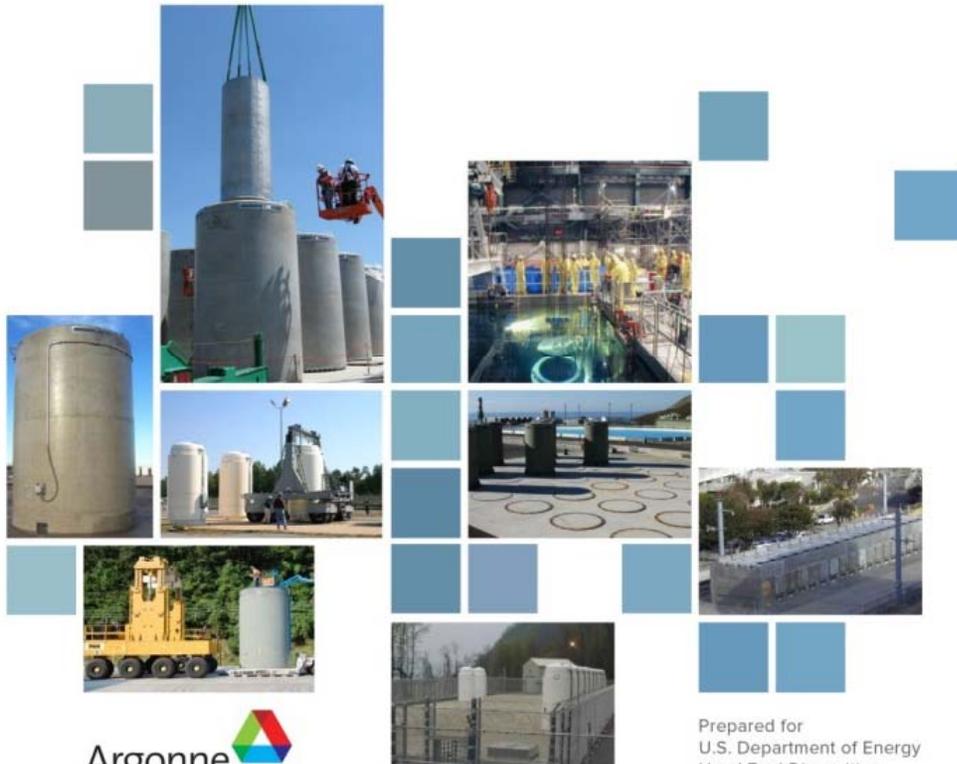


<http://rampac.energy.gov/tracking/rfid/default.aspx>

Managing Aging Effects on Dry Cask Storage Systems

Managing Aging Effects on Dry Cask Storage Systems for Extended Long-Term Storage and Transportation of Used Fuel

REV. 1 | FUEL CYCLE RESEARCH & DEVELOPMENT



Argonne National Laboratory
September 30, 2013
FCRD-UFD-2013-000294
ANL-13/15

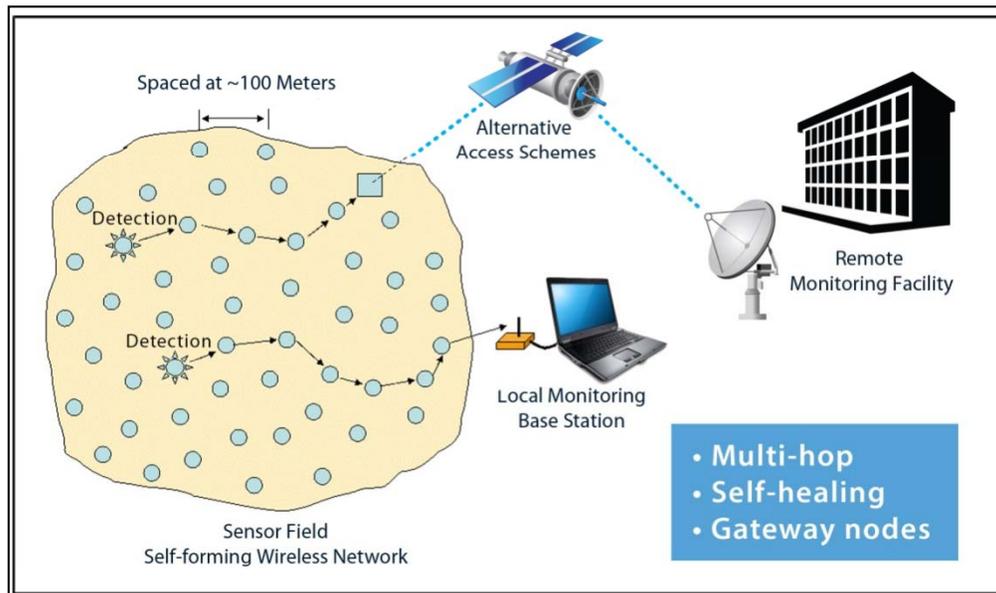
Prepared for
U.S. Department of Energy
Used Fuel Disposition,
Campaign

O.K. Chopra, D. Diercks, D. Ma,
Z. Han, V.N. Shah, S-W Tam,
R.R. Fabian, and Y.Y. Liu

- Provides a framework for establishing the technical basis for extended storage and subsequent transportation of spent nuclear fuel
- Contains recommended aging management programs (AMPs) and time-limited aging analyses (TLAAs) for important-to-safety structures, systems and components of all dry cask storage systems currently in use in the U.S.
- Relies on knowledge of aging degradation mechanisms and inspection & monitoring for detection of aging effects
- Rev. 1 issued in Sept. 2013 for comments by stakeholders; it will be updated by Sept. 30, 2014.

Remote Area Modular Monitoring (RAMM) - Patent Pending

- Multiple sensor suite [T, humidity, radiation (G/N), seal (tamper indication), light shock] on expandable platform
- Wired Ethernet connection, Power-over-Ethernet (PoE) and batteries
- Multiple communication bandwidths (cellular & satellites)
- Monitor critical facilities & SNF dry casks



<http://embedsoftdev.com/embedded/wireless-sensor-network>

Prototype RAMM units

ARG-US (“Watchful Guardian”) RAMM for Dry Cask Monitoring



EM Environmental Management
safety • performance • cleanup • closure
DOE PACKAGING CERTIFICATION PROGRAM

ARG-US RAMM Dry Casks

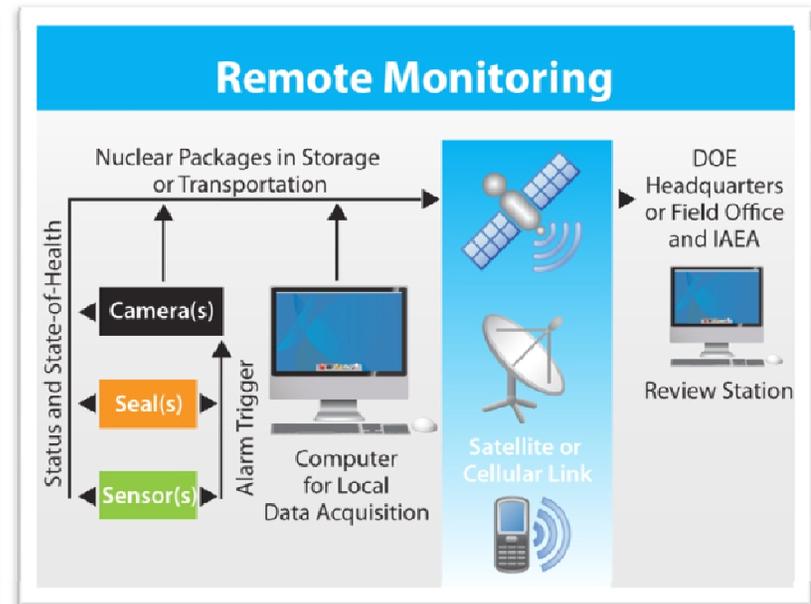
Cask ID: 41987 < X

Map Satellite

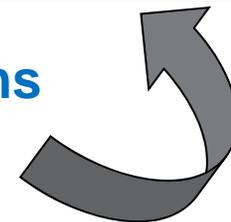
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T1: 20.5 °C
T2: 18.8 °C
T3: 20.5 °C
T4: 18.8 °C
T5: 18.8 °C
T6: 20.8 °C
T7: 19.8 °C
T8: 20.8 °C

ARG-US RAMM surveillance system to enhance safety, security and safeguards for extended storage of SNF



- Integration with existing ISFSI surveillance systems (e.g., video cameras, motion detection, etc.)



Acknowledgment

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Questions? / Discussion

