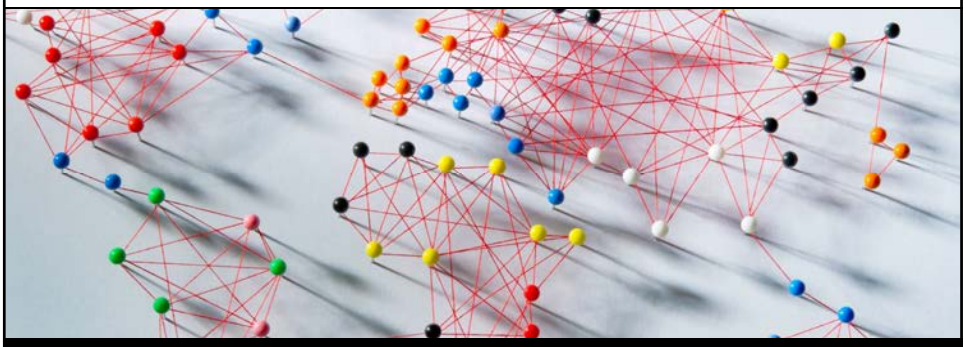
INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials



# 5. Threat Definition

October 24 – November 11, 2016
Albuquerque, New Mexico, USA
Joseph Sandoval

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials



## Learning Objectives:

At the end of this module you should be able to:

- Define the terms 'Alternative Threat Statement approach' and 'Design Basis Threat' (DBT)
- Distinguish between an Alternative Threat Statement and a DBT
- List the organizations that may be involved in threat definition
- Describe the steps in developing a DBT from a Threat Assessment & other Policy Considerations
- List the types of adversary capabilities that should be addressed in the DBT development process
- Explain the use a DBT in the threat-based approach to physical protection

2

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## The Need for a DBT

- **The Security Engineering Problem:** High consequence, low probability event
  - How much security is enough? How do we know?
  - Intelligence estimates are incomplete & change faster than the engineering process can complete
- **Security Engineering Need:** stable, detailed, defensible, design criteria to support:
  - Efficient allocation of resources
  - More objective, less arbitrary design
  - A performance baseline for evaluation of proposed changes
  - Delegation of physical protection responsibilities

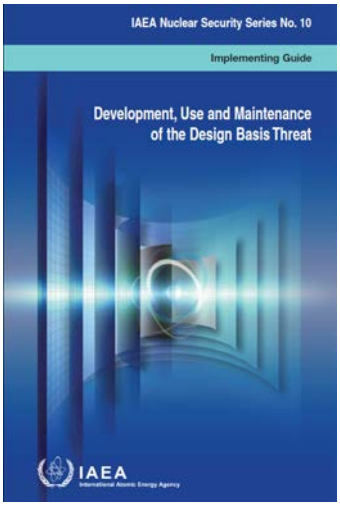
3

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## REFERENCES

1. The Physical Protection of Nuclear Material & Nuclear Facilities, INFCIRC/225/Rev. 5, IAEA, Vienna (2011).
2. The Physical Protection Objectives & Fundamental Principles (GOV/2001/41/Attachment), IAEA, Vienna (2001).
3. Convention on the Physical Protection of Nuclear Material, INFCIRC/274, & the Amendment of 2005 thereto, IAEA, Vienna (2005).
4. Development & Use of the Design Basis Threat, IAEA Nuclear Security Series No. 10 (2009)




"NSS-10"

4

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## IAEA Guidelines Summary

*INFCIRC 225 Rev 5*

- States should define requirements based on the threat (3.10)
  - IAEA Fundamental Principal "G": define the threat (3.34)
  - Ensure PPS meets the threat (3.52), Fundamental Principal "J", Quality Assurance
  - Use either a threat assessment or DBT
  - Employ national intelligence resources to define the threat (3.35)
- Operators should base security plans on the threat (3.27)
  - Address PPS design, evaluation, implementation and maintenance (3.38)
  - Develop plans to counter the threat, Fundamental Principal "K" (3.58)
  - Train guards & response forces on contingency plans (3.60)
  - Execute contingency plans promptly when under attack (3.62)
- States physical protection requirements for NM/NF should be based on a DBT for unauthorized removal of Category I NM or High Radiological Consequences NM/NFs (3.37)
- States should update the threat assessment / design basis threat (3.39)
  - Be prepared to implement temporary compensatory security measures until PPS capabilities are upgraded (3.39)
  - Consider airborne threat & standoff attack threats (3.40)
  - Consider insider threat (3.36)

NSS 10 – Chap 3

5

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Terms of Reference

- Threat – *"An entity with motivation, intention & capability to commit a malicious act."* (NSS-10, glossary)
- Threat Assessment – *"An evaluation of the threats – based on available intelligence, law enforcement, & open source information – that describes the motivations, intentions & capabilities of these threats."* (INFCIRC/225)
- Design Basis Threat – *"The attributes & characteristics of:*
  - *Potential insider &/or external adversaries who might attempt unauthorized removal or sabotage against which a PPS is designed & evaluated. (NSS-10, Sec 2, p.4)*
  - *Threats for which the State organizations & the operators have protection responsibilities & accountability. (NSS-10, Sec 6)*
- Alternative, threat-based approach - Used in situations where a DBT may not be appropriate (NSS-10, Sec 5)
- Sabotage – *"Any deliberate act directed against a nuclear facility or nuclear material in use, storage, or transport which could directly or indirectly endanger the health & safety of personnel, the public or the environment by exposure to radiation or release of radioactive substances.* (INFCIRC/225, p. 53)

6

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Value of a DBT

- Establishes a stable threat basis for design, evaluation, operator accountability, national risk strategy
- Supports agreement between the State & the Operator as to:
  - Threat capabilities that are being protected against
  - Who has primary responsibility for protection against given threats
  - Where risk is accepted

*"The use of the DBT to develop a PPS should lead to an efficient allocation of resources for protection by reducing the arbitrariness that might otherwise exist in establishing requirements for physical protection."*
- IAEA Pub 10, p. 9

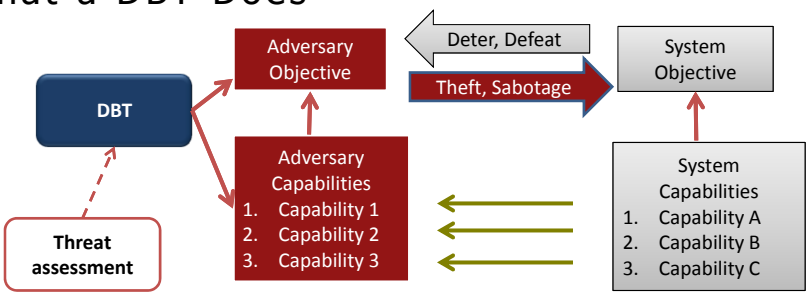
NSS 10 – Chap 2

7

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## What a DBT Does




***DBT Attributes***

- *Reasonable*, based on:
  - Best available intelligence information
  - State-specific policy considerations
- *Defendable*:
  - Provides technical basis for defining performance requirements
- *Cost-Effective*:
  - Supports efficient & effective allocation of resources
- *Confidence*:
  - Helps provide assurance that level of protection is adequate

NSS-10, para 4.2

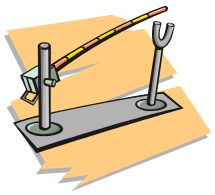
8

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## How a DBT is Used

- Defined Threat/DBT should influence security designs for:
  - Protection of PPS computers & networks (4.10)
  - Vehicle barrier design & location (4.41, 5.30)
  - Personnel access control (5.24)
  - Vital area delay capabilities (5.27)
  - Airborne threat protection measures (5.30)
  - Material transport system protection measures (6.6)



- Defined Threat/DBT is applied to specific engineering / analysis problems by means of scenarios
  - Scenarios apply threat capabilities against the PPS
    - Sabotage objective (5.11)
    - Insider help (5.11)

INFCIRC 225, R5 9

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Defined Threat/DBT Development Roles - Summary

- IAEA recommends separation of roles of DBT development and DBT use
  - Both development and use are under the oversight of the Single Competent Authority
- Development process involves several organizations:
  - State
  - Competent Authority
  - Intelligence organizations
  - License holders / Operators
  - Other organizations

- The State has overall responsibility for the development, implementation, and maintenance of a Defined Threat/DBT
- Good communication and coordination is essential for the Defined Threat/DBT

NSS-10, Chap 4 10

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## State
*Roles & Responsibilities*

Ensures the following:

- Legal framework to support development of a useful DBT
- Determination of unacceptable consequences
- DBT development roles & responsibilities defined
- Competence of DBT developer
- Appropriate intelligence assessment support
- Resource support to the Competent Authority
- Cooperation among the DBT development team
- Effective coordination between DBT developers & DBT users

NSS-10, Chap 4 11

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Competent Authority
*Roles & Responsibilities*

***Competent Authority – Governmental organization / institution designated by a State to carry out security functions*** *(INFCIRC 225, R5)*

- Establishes regulatory framework to support the DBT process
- Identifies State organizations needed to participate in the DBT process
- Leads the DBT process
- Requests the threat assessment & provides necessary information to ensure the result is applicable
- Considers the relevant technical, economic, & policy factors in deciding the DBT
- Coordinates required approvals of DBT
- Distributes DBT to responsible organizations
- Oversees implementation & maintenance of DBT
- Ensures the sensitive DBT information is protected

NSS-10, Chap 4 12

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Intelligence Agency
*Roles & Responsibilities*

- Coordinates among all State intelligence organizations
  - Internal & international
  - Civil & military
- Collects & analyzes intelligence data & information on potential threats to nuclear materials & facilities
  - Individuals & groups
- Leads the process to assess postulated threats to the State nuclear facilities, & ensures the threat assessment is credible

NSS-10, Chap 4 13

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Operator
*Roles & Responsibilities*

***Operator – Any person, organization, or government entity licensed or authorized to undertake the operation of a nuclear facility*** *(INFCIRC 225, R5)*

- Reports security incidents that may aid in understanding local threats
  - Includes incidents from insiders
- Advises the Competent Authority regarding the expected impacts of preliminary DBT decisions
  - Financial, operational, & safety impacts
- Implement effective protection measures in accordance with DBT responsibilities and consistent with CA regulatory guidance

NSS-10, Chap 4 14

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Others Agencies

*Roles & Responsibilities*

Coordinate & share relevant information with agencies responsible for assessing threats & developing DBTs for nuclear facilities

- Law enforcement
- Customs & border control
- Military

NSS-10, Chap 4 15

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Performing a Threat Assessment

- Preliminary stage for developing a DBT
- Threat assessment process has 3 parts:
  - **Input** – A review of existing, actual threat data
  - **Analysis** – A determination of which threats may be considered applicable to nuclear facilities. Includes an assessment of postulated threat characteristics & capabilities
  - **Output** – A documented threat assessment listing postulated, credible threats to the State's nuclear facilities
- There are situations where a DBT may not be appropriate. In these cases an alternative threat statement can be developed.
  - In accordance with graded approach a DBT may not be needed
  - Whether to use a DBT should be based primarily on potential consequences of malicious acts
  - A DBT provides more detail and precise technical basis but requires greater resources

NSS-10, Chap 5 16

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Inputs
*Threat Assessment*

- Include all reliable sources of information
  - Include historical malicious acts, planned events, & training activities
  - Consider level of confidence for information and include all potential adversaries
  - Local, national, regional and international
- Consider:
  - Potential adversary motivations, intentions, and capabilities
  - Adversaries for other high-value, high-consequences assets
- Key Task: ensure mutual understanding
  - Intelligence analysts should understand the protected facility environment
  - Security engineers should understand the intelligence analysis process
  - Result: relevant threat assessment

NSS-10, Para 5.1.1 17

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Analysis
*Threat Assessment*

- Analyze & document each applicable potential adversary:
  - Motivation - *Why*
    - Political, ideological, financial, personal
    - Willingness to die
  - Intention - *What*
    - Nuclear related: theft, sabotage
    - Other: stop operations, social disruption, political instability, economic harm
  - Capabilities - *How*
    - Numbers
    - Weapons & Equipment
    - Explosives
    - Knowledge, skills, & training
    - Tactics
    - Transportation methods
    - Insider assistance

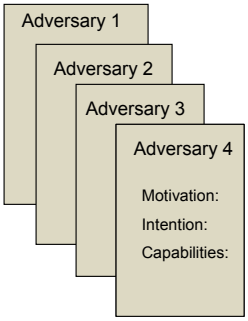
NSS-10, Para 5.1.2 18

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Output
*Threat Assessment*

- Threat assessment document containing postulated threat capabilities against State nuclear facilities
  - Complete list of credible threats
  - Detailed description
  - Credible of information
- Consider identifying facts and assumptions
  - Fact – what we know
  - Assumption – what we don't know to be a fact, but must assume
- Threat assessment is not the DBT
  - Threat assessment independent of policy and resources
  - DBT is a risk-based *decision* as to what will be protected
  - Threat assessment can drive PPS evaluation, where DBT is not required.

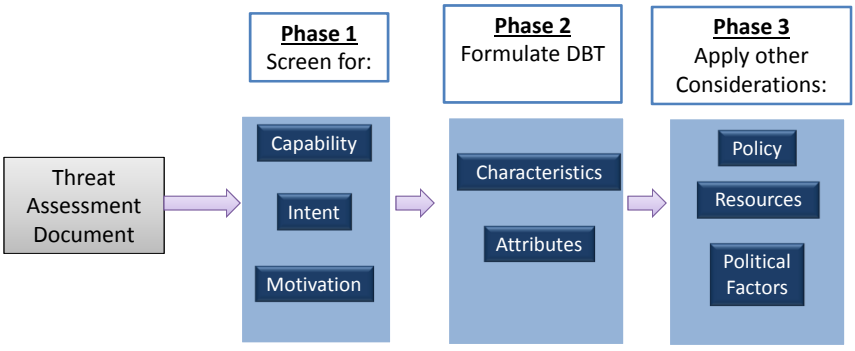



NSS-10, Para 5.1.3 19

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## DBT Development Process Overview



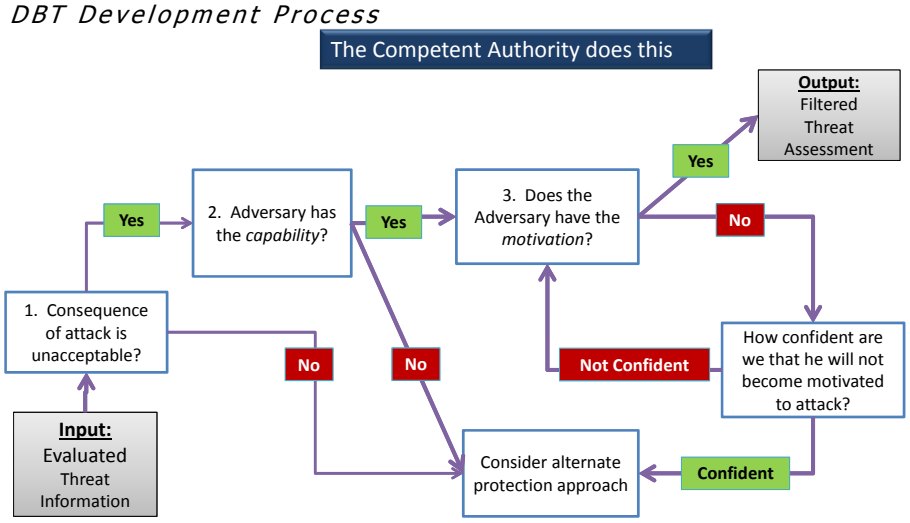

NSS-10, Chap 6 20

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Phase 1: Screen the Threat Assessment

*DBT Development Process*




From NSS-10, fig 3

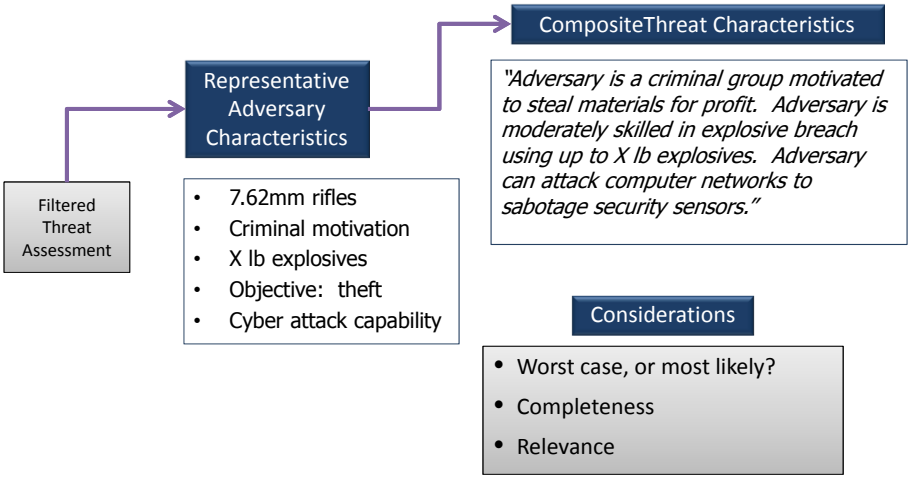
21

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Phase 2: Translate Threat Data into a Threat Profile

*DBT Development Process*




NSS-10, Para 6.2.2

22

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Phase 3: Modify Threat Profile

*DBT Development Process*

- Threat data considerations
  - Uncertainties and differing interpretations of threat data
  - Account for an evolving threat
- Consider costs, benefits & consequences
  - Cost / consequence to society
  - Comparability of approach to similar consequence problems
- Political Considerations
  - Impact of decisions on public confidence
  - Threat situations in neighboring states
  - Confidence of neighboring states in the protection

Competent Authority does this

NSS-10, Para 6.2.3

23

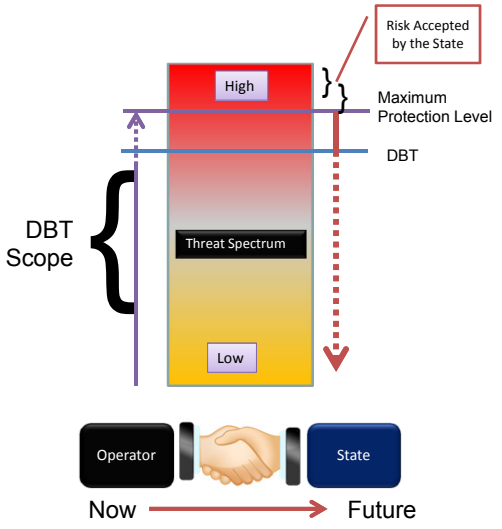
INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## DBT – The Output

*DBT Development Process*

- Two Outputs
  - The DBT (may be more than one)
  - Out-of-scope threats
- Primary responsibility:
  - DBT Threats - Operator
  - Maximum credible threats - State




From NSS-10, fig 1

24

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Using a DBT

- Considerations:
  - Legal & regulatory constraints
  - Security competencies (military, police, regulatory agencies)
  - Operator competencies
  - Potential consequences and resources available
- DBT Implementation
  - Coordinate protection responsiblities within the Government (State)
  - Assign operator protection responsibilities (Regulatory Authority)
  - Appropriately distribute the DBT (Competent Authority)
- How to delegate DBT implementation to the Operator? Alternative approaches:
  - *Performance based* - Provide a general mission requirement to mitigate the DBT
    - Operator develops the performance metrics & designs the solution
  - Provide specific performance requirements;
    - Operator designs a solution
  - *Compliance based* - Provide comprehensive prescriptive requirements
    - Operator complies with requirements
  - In practice, DBT implementation will have both prescriptive and performance requirements

NSS-10, Chap 7 25

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## DBT Influence on PPS Design

*Using a DBT*

- Threat scenarios form the basis for understanding the threat & evaluating security performance
- Threat scenarios based on the Defined Threat/DBT
  - Adversary objectives & tactics
- Threat scenarios identify vulnerabilities for mitigation by the PPS

NSS-10, Chap 7 26

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Maintaining the DBT

- Things change
  - The threat
  - Change in nuclear program
  - The political, legal, security, & resource environment
- Plan for change
  - Review cycles
  - Change criteria
  - Resource appropriation cycles
  - Design & Implementation timelines
  - Evaluation
- Same process used as for developing a Defined Threat/DBT
- Review may or may not change the Defined Threat/DBT

NSS-10, Chap 8

27

INTERNATIONAL TRAINING COURSE
on the Physical Protection of Nuclear Facilities and Materials

Design Basis Threat

## Summary

- Potential adversary motivation, intentions, & capabilities are the main drivers for a performance-based PPS
- Relevant adversary capabilities are formulated in a DBT
  - Threat Assessment output is coalesced into composite adversary description & modified for policy issues to result in a DBT
- DBT supports security risk management as part of the regulatory framework
- Decision on whether a DBT is appropriate requires comparing the benefits and effort to develop a DBT against an alternative threat approach. Cat I NM and HRC NM/NF require the use of DBTs
- Principal roles in threat development include the State, Regulatory Authority, Intelligence Organizations, License Holders, & other organizations
  - Competent Authority is responsible for developing, implementing & maintaining a DBT
  - Licensees are responsible for implementing protection measures against the DBT

28