# Beyond Guns, Gates and Guards

## An Integrated Approach to Nuclear Material Security

**Presented by Maegon Barlow**

**Dave Huizenga, Maegon Barlow, and Elly Melamed**

**Director**
**Office of International Material Protection and Cooperation**

**The United States Department of Energy**

# Beyond Guns, Gates and Guards

- The work implemented by the Office of International Material Protection and Cooperation (IMPC) has often been summarized as focusing on "guns, guards, and gates" (the "3 Gs").

- While the "3Gs" remain necessary, they are no longer sufficient for protecting against today's nuclear threats.

- Achieving effective nuclear security demands a more holistic, interdisciplinary and layered approach.

- This paper will discuss the evolution of the IMPC Program's strategy to develop and implement an integrated approach to nuclear material security.

# Presentation Goals

- The Evolving Threat of Nuclear Terrorism
- Mission of the Office of International Material Protection and Cooperation
- A brief overview of the IMPC Program and Major accomplishments to date
- Evolution of the IMPC Program
- Future Challenges

# The Evolving Threat

- Terrorism has undergone a fundamental shift.
- Desire to cause maximum damage
- Open-source media has reported that terrorists now seek to acquire nuclear materials or weapons stolen and smuggled from nuclear sites to inflict mass civilian casualties.
- A bomb with the explosive power of 10,000 tons of TNT, if set off in a major city on a typical workday, could kill up to 500,000 people and cause roughly $1 trillion in direct economic damage (Harvard University report).

# The Evolving Threat

- Devastating consequences would have a global impact and therefore a dedicated global effort is required to prevent nuclear and radiological terrorism.

- The key barrier preventing terrorists from achieving nuclear attack capability is the difficulty of acquiring weapons-useable nuclear materials.

# The IMPC Mission

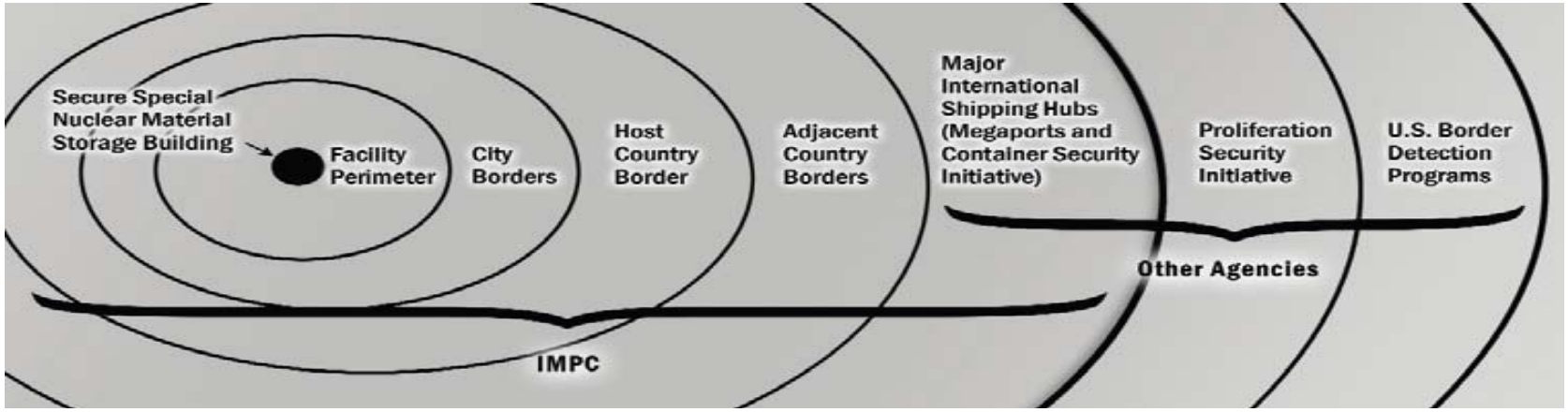
- The *Office of International Material Protection and Cooperation* is responsible for enhancing the security of vulnerable stockpiles of nuclear weapons & weapons useable materials in countries of concern and to improve the ability to deter and detect the illicit trafficking of such materials.

- Began in 1994 as a task force to mitigate the security vulnerabilities

- Program has evolved into a global effort, engaging over 40 countries to deny terrorists the vital materials needed to engage in acts of nuclear terror.

# Defense In Depth Strategy

- **The IMPC implements this mission by pursuing** *defense in depth strategy* **that includes both a** *first line of defense*, **the material protection control and accounting program, as well as a** *second line of defense* **focused on the interdiction of illicit radiological materials at international border crossings, airports and seaports.**



National Nuclear Security Administration

# IMPC Program Overview


## First Line of Defense – MPC&A

## Second Line of Defense – SLD

# MPC&A Objectives

- Secure: Implement security upgrades (physical protection, material control and accounting, and protective force related enhancements) appropriate for the level of material attractiveness and the threat of theft;

- Reduce: Consolidate material into fewer buildings and at fewer sites and convert excess HEU to LEU, reduce the number of threat targets; and,

- Sustain: Encourage the development of national and site capabilities and commitments to operate and maintain these security improvements.


**Rosatom Weapons Complex**

1 Arzamas-16, Sarov, All-Russian Scientific Research Institute of Experimental Physics (VNIIEF)
2 Chelyabinsk-70, Snezhinsk, All-Russian Scientific Research Institute of Technical Physics (VNITF)
3 Chelyabinsk-65, Ozersk, Mayak Production Association (MPA)
4 Sverdlovsk-44, Novouralsk, Ural Electrochemical Integrated Plant (UEIP)
5 Tomsk-7, Seversk, Siberian Group of Chemical Enterprises (SGChE)
6 Krasnoyarsk-26, Zheleznogorsk, Mining and Chemical Combine (MCC)
7 Krasnoyarsk-45, Zelenogorsk, Electrochemical Plant (ECP)
8 Sverdlovsk-45, Lesnoy
9 Penza-19, Zarechnyy
10 Zlatoust-36, Trekhgornyy

**Russian Civilian Sites**

11 Bochvar All-Russian Scientific Research Institute of Inorganic Materials (VNIINM), Moscow
12 Institute of Theoretical and Experimental Physics (ITEP), Moscow
13 Moscow State Engineering and Physics Institute (MEPhI), Moscow
14 Scientific Research and Design Institute of Power Technology (RDIPE), Moscow
15 Research Institute of Scientific Instruments (RISI), Lytkarino, Moscow region
16 Machine Building Plant (MSZ), Elektrostal, Moscow region
17 Scientific Production Association Luch, Podolsk, Moscow region
18 Institute of Physics and Power Engineering (IPPE), Obninsk
19 Karpov Institute of Physical Chemistry, Obninsk
20 Khlopin Radium Institute (KRI), St. Petersburg
21 Krylov Shipbuilding Institute, St. Petersburg
22 Petersburg Nuclear Physics Institute (PNPI), Gatchina, St. Petersburg region
23 Atomflot Port, Murmansk
24 Afrikantov Experimental Machine Building Design Bureau (OKBM), Nizhniy Novgorod
25 Joint Institute of Nuclear Research (JINR), Dubna
26 Scientific Research Institute of Atomic Reactors (NIIAR), Dimitrovgrad
27 Beloyarsk Nuclear Power Plant (BNPP), Zarechnyy
28 Institute of Nuclear Materials (INM) (formerly SF-NIKIET), Zarechnyy
29 Novosibirsk Chemical Concentrates Plant (NCCP), Novosibirsk
30 Nuclear Physics Institute (NPI), Tomsk

**Navy**

Murmansk Vicinity
31 CBC A1
32 CBC A2
33 CBC A3
34 CBC A4
35 CBC A5
36 CBC B1
37 CBC B2
38 CBC B3
39 PBZ B1
40 CBC C1
41 CBC C2
42 CBC C3
43 PBZ C1
44 PBZ C2
45 CBC D1
46 CBC E1

Vladivostok Region
47 CBC P1
48 CBC P2
49 CBC P3
50 CBC P3-2
51 CBC P3-3
52 CBC P3-4
53 CBC P4
54 CBC P5
55 CBC P6
56 CBC P7
57 CBC P8
58 CBC P9

Petropavlovsk-Kamchatskiy Region
59 CBC K1
60 CBC K2
61 CBC K3
62 CBC K3-2
63 CBC K3-3
64 CBC K3-4
65 CBC K4
66 CBC K5
67 CBC K6
68 PBZ K1
69 PBZ K2

70 Kurchatov Institute, Moscow
71 Sergiev Posad
72 PM-12 Refueling Ship, Murmansk
73 Navy Site 48, Murmansk
74 Severodvinsk Shipyard, Severodvinsk
75 PM-63 Refueling Ship, Severodvinsk
76 PM-74 Refueling Ship, Vladivostok
77 Navy Site 32, Vladivostok
78 Navy Site 34, Vladivostok
79 Navy Site 88, Vladivostok

**Strategic Rocket Forces**

80 GSM 1AR
81 GSM 1AL
82 GSM 2AR
83 GSM 2AL
84 GSM 3AR
85 GSM 3AL
86 GSM 1BR
87 GSM 1BL
88 GSM 1BT
89 GSM 2BR
90 GSM 2BT
91 GSM 3BR
92 GSM 3BT
93 GSM 4BR
94 GSM 4BT
95 GSM 5BR
96 GSM 5BL
97 GSM 5BT
98 GSM 6BR
99 GSM 6BT
100 GSM 7BR
101 GSM 7BL
102 GSM 7BT
103 GSM 8BR
104 GSM 8BT

**12th Main Directorate**

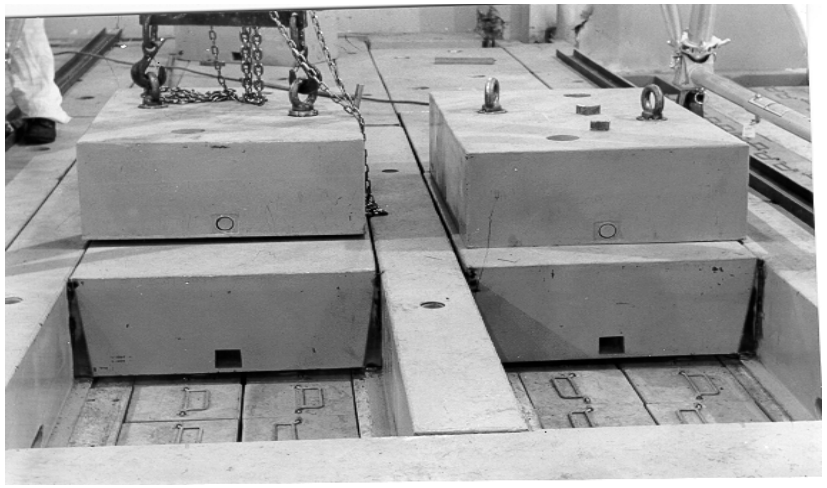
105 W-18
106 W-19
107 W-44
108 E-1
109 E-41
110 W-5
111 W-45
112 CBC M1
113 CBC T1

**NIS and the Baltics**

114 Salaspils Institute of Nuclear Physics, Latvia
115 Ignalina Nuclear Power Plant, Lithuania
116 Joint Institute for Power and Nuclear Research (SOSNY), Belarus
117 Kyiv Institute of Nuclear Research, Ukraine
118 Kharkiv Institute of Physics and Technology, Ukraine
119 South Ukraine Nuclear Power Plant, Ukraine
120 Sevastopol National University of Nuclear Energy and Industry (SNUNEI), Ukraine
121 Tbilisi Institute for Physics, Georgia
122 Mangishlak Atomic Energy Complex, Aktau, Kazakhstan
123 Institute of Atomic Energy, Kurchatov, Kazakhstan
124 Ulba Metallurgical Plant, Ust-Kamenogorsk, Kazakhstan
125 Institute of Nuclear Physics, Alatau, Kazakhstan
126 Institute of Nuclear Physics, Tashkent, Uzbekistan

November 2008

# SECURE



- Graded approach to augmenting nuclear security, starting with securing nuclear material in place

- Target-out, defense-in-depth security approach that encompasses physical protection, material control and accounting, and response forces upgrades.

# SECURE

- Rapid Upgrades:
  - Quick, usually low-tech security enhancements such as hardened windows, doors and vaults, the provision of scales, hand-held SNM detectors

- Comprehensive Upgrades:
  - longer term, more time intensive measures such as automatic accounting systems, radiation portal monitors (RPMs), upgraded entry control points, central alarm stations, and closed-circuit television (CCTV) systems.

# Alarm & Communication Networks, SNM Detection, Pro Force, Accounting

# Status of Security Efforts

- Suite of upgrades expanded after the September 11, 2001 to address the changing threat environment.
- The IMPC and its international partners have provided substantial security upgrades to 123 sites in Russia and the FSU.
- In conjunction with a focus on sustainability of completed upgrades, continuation of work with counterparts to identify and address any remaining vulnerabilities.

# REDUCE

- Reduce the amount of weapons grade material by down-blending HEU to LEU as well as reducing the number of targets by consolidating material into fewer buildings and at fewer sites.

- Similar efforts are on-going in the DOE complex

- More than 11 metric tons of HEU has been down-blended into LEU through December 2008 and consolidation effort has removed HEU from 25 buildings

# SUSTAIN

- Long-term, sustained risk reduction is essential for program success
- Approach goes beyond the provision of equipment to take into account the less tangible elements of security such as training, procedures, and security culture.
- Provision of technical assistance and professional collaboration at the national level

# SECURITY CULTURE

- Recognition of security culture as an intrinsic sustainability element

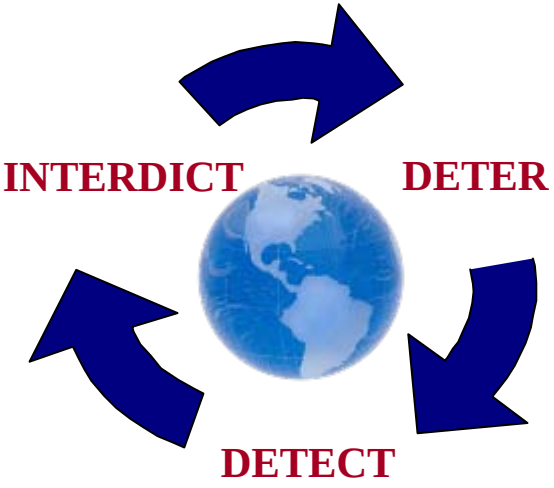
- "*effectiveness of the nuclear security regime depends not only on the design, quality and conditions of the technical equipment, but on the design and quality of the administrative processes and the behaviors of the people involved*."

# Second Line of Defense (SLD)

**MISSION:** Strengthen the capabilities of partner countries to ***deter, detect,*** and ***interdict*** illicit trafficking of special nuclear and other radioactive materials at international border crossings, airports, seaports, and other points of entry.

**STRATEGY:** Develop cooperative efforts to mitigate the risk of illicit trafficking through:

- **Search, detection, and identification of nuclear and other radioactive materials**
- **Development of response procedures and capabilities**
- **Deterrence of future trafficking in illicit nuclear and nuclear-related materials**




**GOAL:** Deliver an effective and sustainable global capability to *deter, detect, and interdict* illicit trafficking in special nuclear and other radioactive materials.

# SLD: Two Primary Programs

## Second Line of Defense

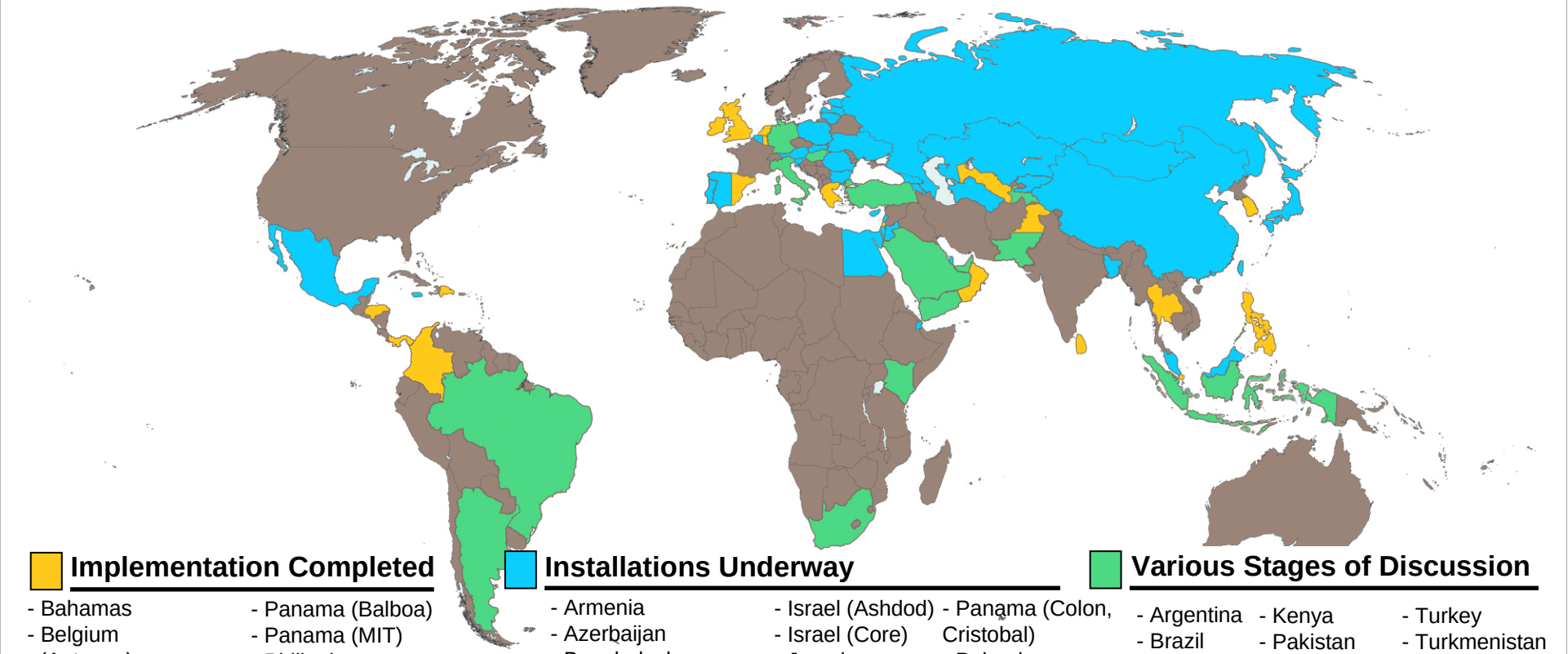
### Core Program

- **Equip approximately 600 points of entry: airports, border crossings, and small feeder seaports**
- **Bolster detection capabilities of foreign border officials or affiliated agencies**
- **Partner with international or multilateral organizations**
  - -International Atomic Energy Agency (IAEA)
  - -European Union

### Megaports Initiative

- **Equip approximately 100 international seaports**
- **Bolster detection capabilities of foreign customs officials and port authorities**
- **Partner with other U.S. federal agencies**
  - -CBP/ICE: Container Security Initiative (CSI)
  - -CBP: Secure Freight Initiative (SFI)
  - -DHS: ASP deployment

# SLD Around the Globe



## Implementation Completed

- Bahamas
- Belgium (Antwerp)
- Colombia
- Dominican Republic
- Greece
- Honduras
- Israel-(Haifa)
- Netherlands
- Oman (Salalah)
- Pakistan (M. Qasim)
- Panama (Balboa)
- Panama (MIT)
- Philippines
- Singapore
- South Korea
- Spain (Algeciras)
- Sri Lanka
- Thailand
- United Kingdom
- Uzbekistan

## Installations Underway

- Armenia
- Azerbaijan
- Bangladesh
- Belgium (Zeebrugge)
- Bulgaria
- China
- China (Hong Kong)
- Cyprus
- Djibouti
- Dubai
- Egypt
- Estonia
- Georgia
- IAEA
- Israel (Ashdod)
- Israel (Core)
- Jamaica
- Japan
- Jordan
- Kazakhstan
- Kyrgyzstan
- Latvia
- Lebanon
- Lithuania
- Malaysia
- Malta
- Mexico
- Mongolia
- Panama (Colon, Cristobal)
- Poland
- Portugal
- Qatar
- Romania
- Russia
- Slovakia
- Slovenia
- Spain
- Taiwan
- Turkmenistan
- Ukraine

## Various Stages of Discussion

- Argentina
- Brazil
- Germany
- Hungary
- Indonesia
- Italy
- Kenya
- Pakistan
- Saudi Arabia
- South Africa
- Tajikistan
- Turkey
- Turkmenistan
- Yemen
- UAE

# SLD Accomplishments Through FY08

- Completed Megaports radiation detection equipment installation at 19 ports
  - At various stages of implementation at more than 20 additional ports around the world.
- Installed radiation detection equipment at 213 Second Line of Defense Core sites (land border crossings, airports, and sea ports) in Russia and six other countries of concern.
- Reached agreement with Russia to complete the installation of radiation detection equipment at all Russian border crossings (approx 350 sites total) by 2011
  - DOE and Russian Customs sharing costs and responsibility for this work
  - To be completed 6 years ahead of original schedule

# Evolution of the IMPC Program

- As the IMPC Program has matured, so has its approach to addressing today's challenges to prevent nuclear terrorism.
- Security approach is continually evolving to keep up with the ever changing threat environment.
- Both the first line of defense and second line of defense programs have responded by initiating new collaborative efforts focused on enhancing the ability to secure materials and improve detect and respond to illicit trafficking

# Maturation of the MPC&A Program

- Greater attention to the role that MC&A plays as the first line of defense against insider related vulnerabilities

- Concerted effort to ensure that measures to defeat insider diversion are being effectively employed and promoted both within our bilateral cooperation with States as well as within the international arena.

# Focus on Integrated Nuclear Materials Security

- *Global Initiative/1540 Workshop*
  - Discuss what constitutes “appropriate effective” nuclear material accounting and physical protection measures as required under United National Security Council Resolution 1540 (UNSCR 1540).

- *Goal*
  - Facilitate a discussion between policymakers and those responsible for implementation and oversight of nuclear material security, on the meaning of “appropriate effective” nuclear security measures and the identification and improvement of instruments and best practices that support the implementation of this requirement.

# ‘Appropriate Effective’ Nuclear Security – Focus on MC&A

- Recommendation for further technical exchanges on what constitutes “appropriate effective” MC&A at the facility level and how MC&A can be more fully integrated with physical protection to enhance a defense-in-depth approach to nuclear security with particular attention to insider related vulnerabilities.

- IMPC’s cooperation with the IAEA's Office of Nuclear Security

# New Developments in SLD

- Close collaboration with the IAEA and EU to coordinate efforts and enhance training and other technical assistance provided to States.

- Pilot collaboration with partner-country law enforcement officials, to enhance capabilities to investigate and act against smugglers.

# Future Challenges

- Build on past achievements and continue to develop our cooperative efforts with its international partners and multilateral organizations to address existing vulnerabilities.

- Continue working with our bilateral partners in the multilateral arena, to inform policymakers and promote and strengthen the international nuclear security regime.

- Acknowledge the challenges that remain and address existing gaps.

# Summary

- Beyond a “guns, gates, and guards” approach to emphasize the importance of an integrated nuclear security approach that provides sufficient tools and builds on past successes and lessons learned to adapt and respond to evolving and complex threats.

- Continuation of work with both bilateral and multilateral partners to identify and address existing security vulnerabilities and will continue to establish and maintain strong collaborative relationships with partner countries and with other international organizations in order to ensure a sustained, global effort against nuclear terrorism.