

The Nuclear Non-Proliferation Regime & IAEA Verification

**{ Laura Rockwood
{ Senior Fellow, VCDNP**

ISODARCO

**“Nuclear Risk, Technological Disruption and International
Conflict in an Age of Turbulence”**

Andalo, Italy

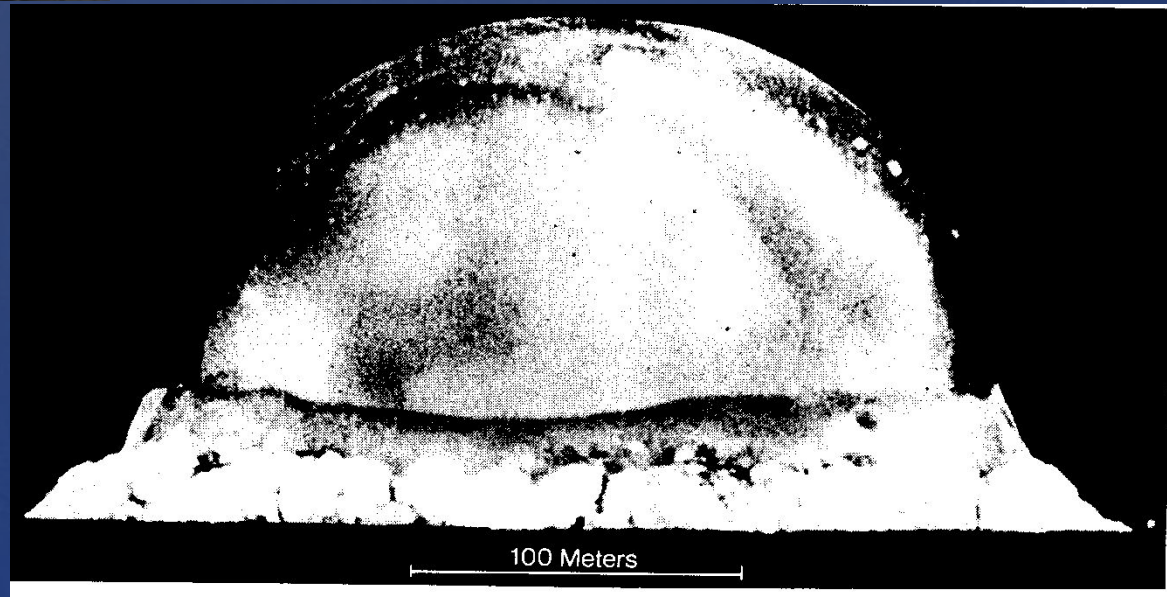
11 – 18 January 2025

The Dawn



1938: Discovery of
uranium fission – Lise
Meitner & Otto Hahn

July 1945: Trinity
Test

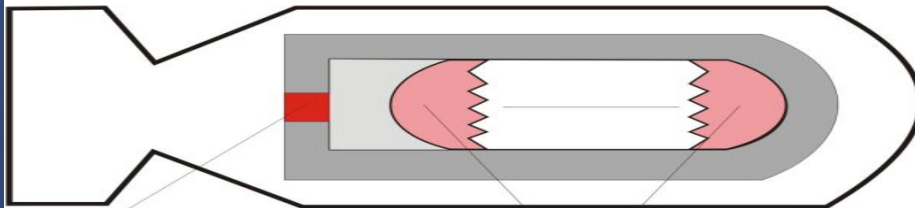


The Threat

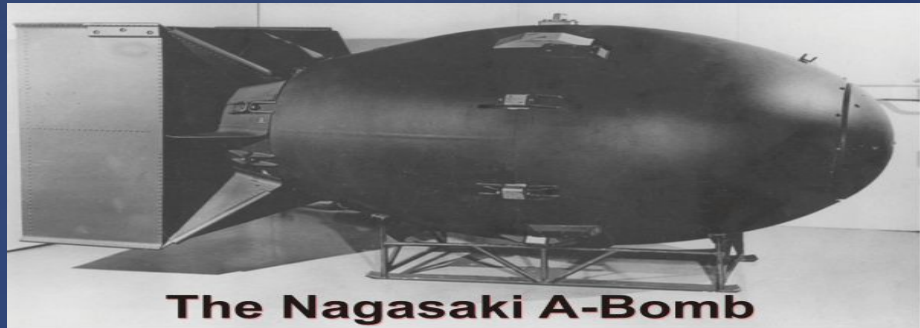


The Hiroshima A-Bomb

◀ 6 Aug. 1945: “Little Boy”

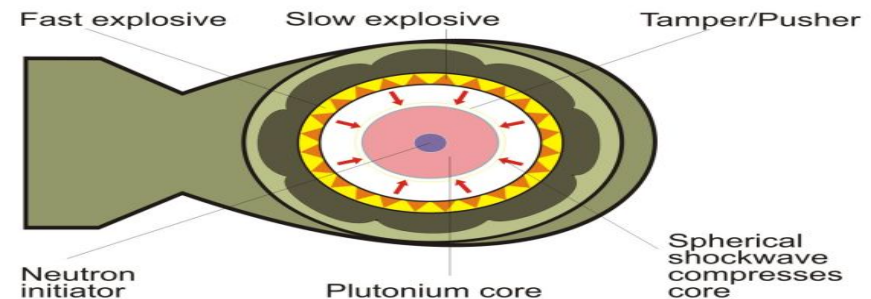


Length	120 inches (approx. 3 metres)
Diameter	28 inches (approx. 0.7 metre)
Weight	9,000 lbs. (Approx. 4 tons)
Element	Uranium 235



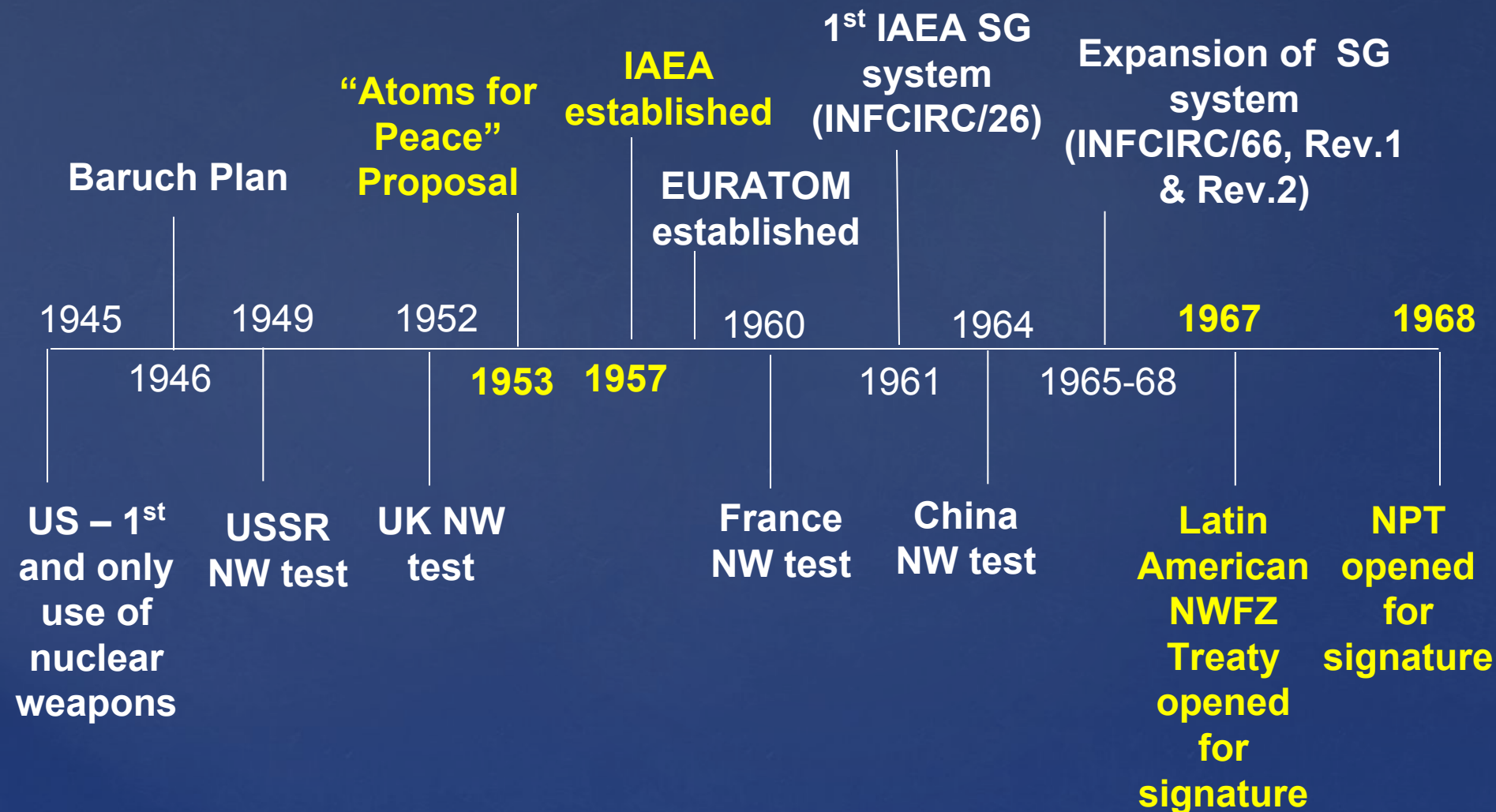
The Nagasaki A-Bomb

9 Aug. 1945: “Fat Man” ▶



Length	128 inches (approx. 3.2 metres)
Diameter	60 inches (approx. 1.5 metres)
Weight	10,000 lbs. (approx. 4.5 tons)
Element	Plutonium 239

The First Twenty-Five Years: Creation of the IAEA and its Safeguards System



Price: 5 Francs

Subscription Rates
Listed on Page Two

58th Year—No. 19,405

NEW YORK

Herald



Tribune

EUROPEAN
EDITION

THE NEW YORK HERALD
ESTABLISHED IN EUROPE 1870

PARIS, WEDNESDAY, JUNE 27, 1945

United Nations Adopt World Charter

B29s Bomb 10 Japanese War Plants

Four Industrial Areas
On Honshu Blasted by
450 to 500 Super-Forts

Aircraft and Parts Factories Attacked

Osaka Army Arsenal One
Of Targets of Raiders

BULLETIN

WASHINGTON, June 26 (AP).—A medium force of Super-Forts launched a new attack on industrial targets on the Japanese main island of Honshu, the 16th Air Force announced. The attack was made by the 1st Bomber Command shortly after midnight (June 21, Japanese time). The target was Yokohama, near Nagoya, which was blasted only a few hours after an attack

A 'Boy at the Dike' In a Modern Setting

Scene in The European Edition
KANSAS CITY, June 26.—Lieutenant Commander Wayne A. Parker, engine officer on the U.S.S. Ringgold, told today how he backed into a hole below the waterline when the vessel was ripped by Japanese shore batteries.

"The jagged hole was mighty uncomfortable," he said. "And it cost me five minutes of anxiety and a new pair of trousers."

But the human plot saved the ship and won a Navy Cross.

Crowley Says Reich Policing Must Be Lasting

Asserts Germany Still Has
Her Industrial Strength,
Despite Allied Bombing

From the Herald Tribune Bureau
WASHINGTON, June 26.—Leo T. Crowley, Foreign Economic Adminis-

Seized Gold Seen Put to Reich's Use

France Unable to Learn
Details of Hoard Seized
By American 3d Army

By Geoffrey Parsons Jr.

Gold captured in Germany, so far as the French government can discover from British and American authorities, is to be used during the coming winter to pay for lending and rebuilding Germany, regardless of whether or not the gold was stolen from the Allied governments.

All efforts of the British and French governments to check the identity of the gold discovered by the American 3d Army at Frankfurt have been bluntly discouraged, despite United Nations declarations of January 5, 1943, and February 22, 1944, in which it was specifically stated that the transfer of gold from one occupied country to another by the Nazis would never be recognized.

The gold question, however, is not the subject of the major in-

Ban on Aggression Is Voted, Human Rights Guaranteed

United Nations' New World Charter Provides for
Collective Peace Measures and Solution of
Social, Economic and Cultural Problems

By the Associated Press
SAN FRANCISCO, June 26.—The essential substance of the new world charter—a document, 28,000 words long and nine weeks in the making by delegates of 51 nations—will be summarized as follows:
It will enable the United Nations to take collective measures for the prevention and removal of threats to peace and for the suppression of acts of aggression or other breaches of the peace, and to bring about by peaceful means the settlement of international disputes which might lead to a breach of the peace.
It will achieve international cooperation in solving problems of an economic, social, cultural or humanitarian character, and in encouraging respect for human rights and fundamental freedoms without distinction as to sex, language or religion.
All members shall settle their international disputes by peaceful means, and shall refrain from the threat or use of force against the territorial integrity or political independence of any state. Members

shall refrain within the domestic jurisdiction of any state.
Membership in the United Nations is open to all peace-loving states, but members may be suspended or expelled by the General Assembly upon the recommendation of the Security Council. The General Assembly consists of all members of the United Nations, while Great Britain, France, China, the United Kingdom and the United States have permanent seats on the Security Council and six non-permanent members are to be elected for terms of two years each.
The Security Council, to enforce its own decision, may call upon the United Nations members to take action short of armed intervention, such as interrupting communications or severing diplomatic relations. If such action is inadequate, the Council can utilize land, sea and air forces. Members of the United Nations must make available to the Council armed forces and other facilities.
Regional pacts may be made by the members provided they are

Closes Conference



President Truman

President Hails Parley's Success

Truman Tells Closing Session of
San Francisco Conference It Has
Laid Foundation for Lasting Peace

Special to The European Edition

SAN FRANCISCO, June 26.—The charter of the United Nations, a document written in conference here by the representatives of fifty nations to outline their hopes and plans for a future world of peace and security, was formally signed today.

President Harry S. Truman witnessed the signing by delegates of the United States, and addressed the closing session of the conference, praising it for creating "a great instrument for peace and security and human progress in the world."

"But now the world must use it," he said, "otherwise, we shall betray all those who have died in order that we might meet here in freedom and safety to create it."

The delegates, who voted their final approval of the charter at a primary session late last night, began affixing their signatures, at noon. The first was Wellington Koo, of China, who put on his signature with a Chinese writing brush. Sitting in a blue chair before the oval table, Mr. Koo said, "This is a great day for all."

1 (I). ESTABLISHMENT OF A COMMISSION TO DEAL WITH THE PROBLEMS RAISED BY THE DISCOVERY OF ATOMIC ENERGY

Resolved by the General Assembly of the United Nations to establish a Commission, with the composition and competence set out hereunder, to deal with the problems raised by the discovery of atomic energy and other related matters:

5. TERMS OF REFERENCE OF THE COMMISSION

The Commission shall proceed with the utmost despatch and enquire into all phases of the problem, and make such recommendations from time to time with respect to them as it finds possible. In particular, the Commission shall make specific proposals:

(a) for extending between all nations the exchange of basic scientific information for peaceful ends;

(b) for control of atomic energy to the extent necessary to ensure its use only for peaceful purposes;

(c) for the elimination from national armaments of atomic weapons and of all other major weapons adaptable to mass destruction;

(d) for effective safeguards by way of inspection and other means to protect complying States against the hazards of violations and evasions.

SURE—AND HOW ABOUT
ALL THOSE OTHER THINGS...

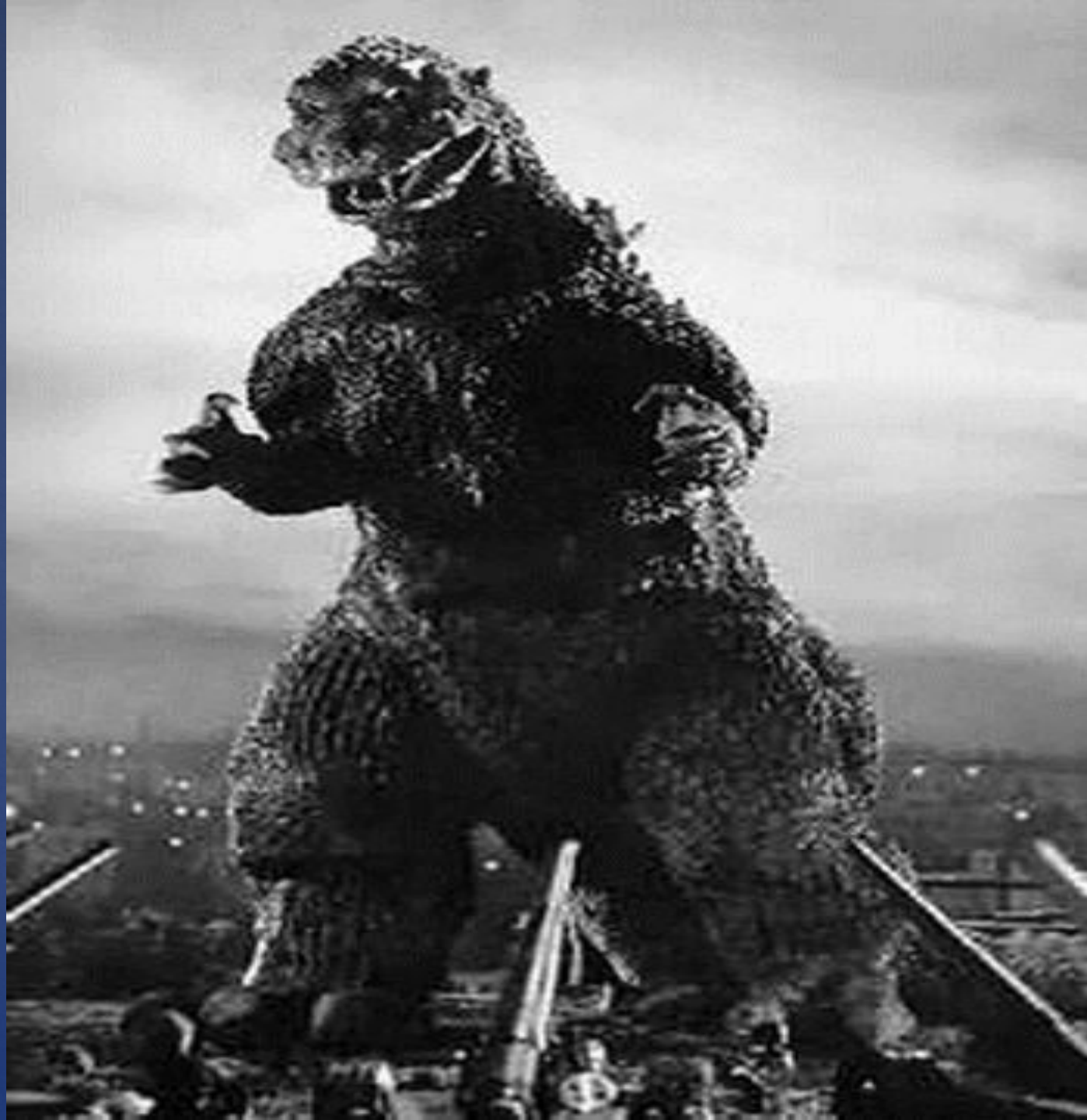
"ATOMIC FLYING MACHINES
ON MY BACK."

"ATOMIC
DISINTEGRATOR
GUNS."

"ATOMIC ROCKETS
TO THE MOON."

"ATOMIC 'PILLS' TO RUN
OUR AUTOS FOR YEARS."

HOLD ON,
JOHNNY...
YOU'VE BEEN
READING
TOO MANY
COMICS!



Challenges of the 1950's – 60's

Perceived Risk?

Misuse of *supplied* material and items

Exercise unilateral restraint in sharing technology

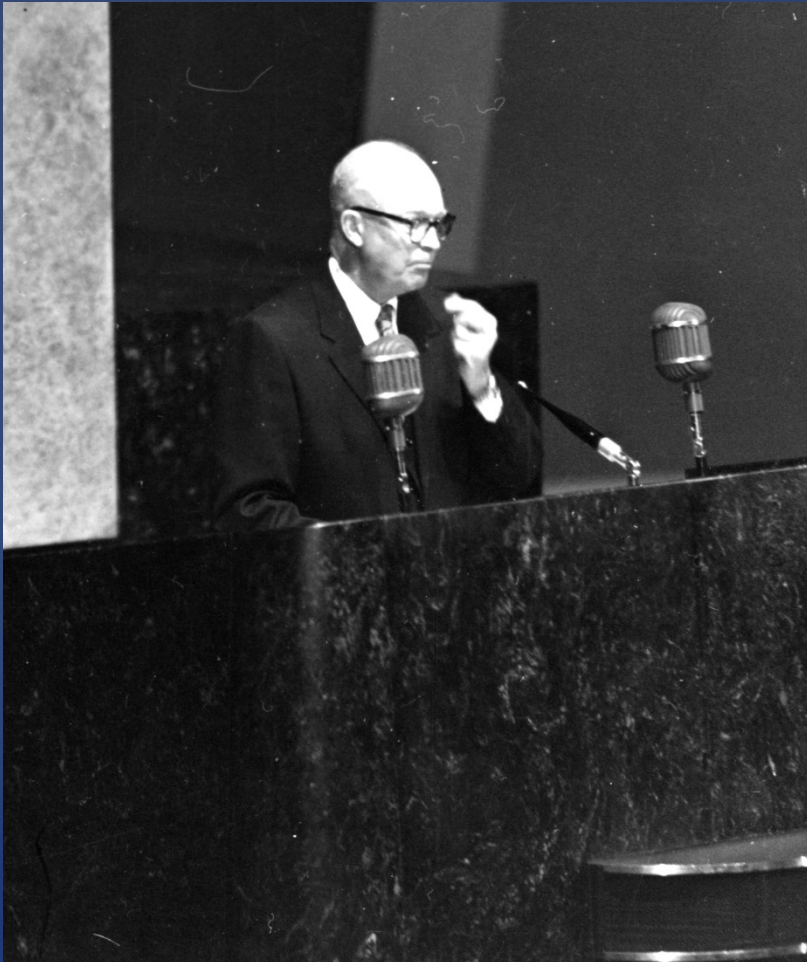
AND

Create independent international verification body

AND

Develop system for verifying use of supplied material
and items

Atoms for Peace – 1953



“ ... the dread secret of making [nuclear] weapons is not ours alone ...”

US shift from a policy of secrecy and denial to openness and transparency through international cooperation and verification

The IAEA

- Created by the Statute of the IAEA in 1957
- Autonomous inter-governmental organization
- Unique relationship with UN Security Council
- Not a UN organization
- 180 Member States
- Authority to implement safeguards



The IAEA Statute

- Article III.A.5

- Agency assistance
- To bilateral or multilateral arrangements
 - *e.g. NPT; Nuclear Weapon Free Zone Treaties*
- To any nuclear activities of a State, at its request

- Article XII

- Safeguards measures
 - On site inspection
 - *Any time, any place access*
 - Reports and record keeping
 - Non-compliance

- Article XX

- Definition of nuclear material
 - Special fissionable material: plutonium, U (enriched)



IAEA safeguards

- Membership in IAEA does *not require* acceptance of safeguards
- IAEA safeguards possible in non-Members (and in non-States)
 - DPRK
 - Taiwan, China
- Requires consent of State
 - Voluntary undertaking
 - Security Council Chapter VII
 - Sui Generis Arrangements
 - Safeguards Agreement



Types of safeguards agreements

- Item-Specific (INFCIRC/66-type)

- India, Israel and Pakistan

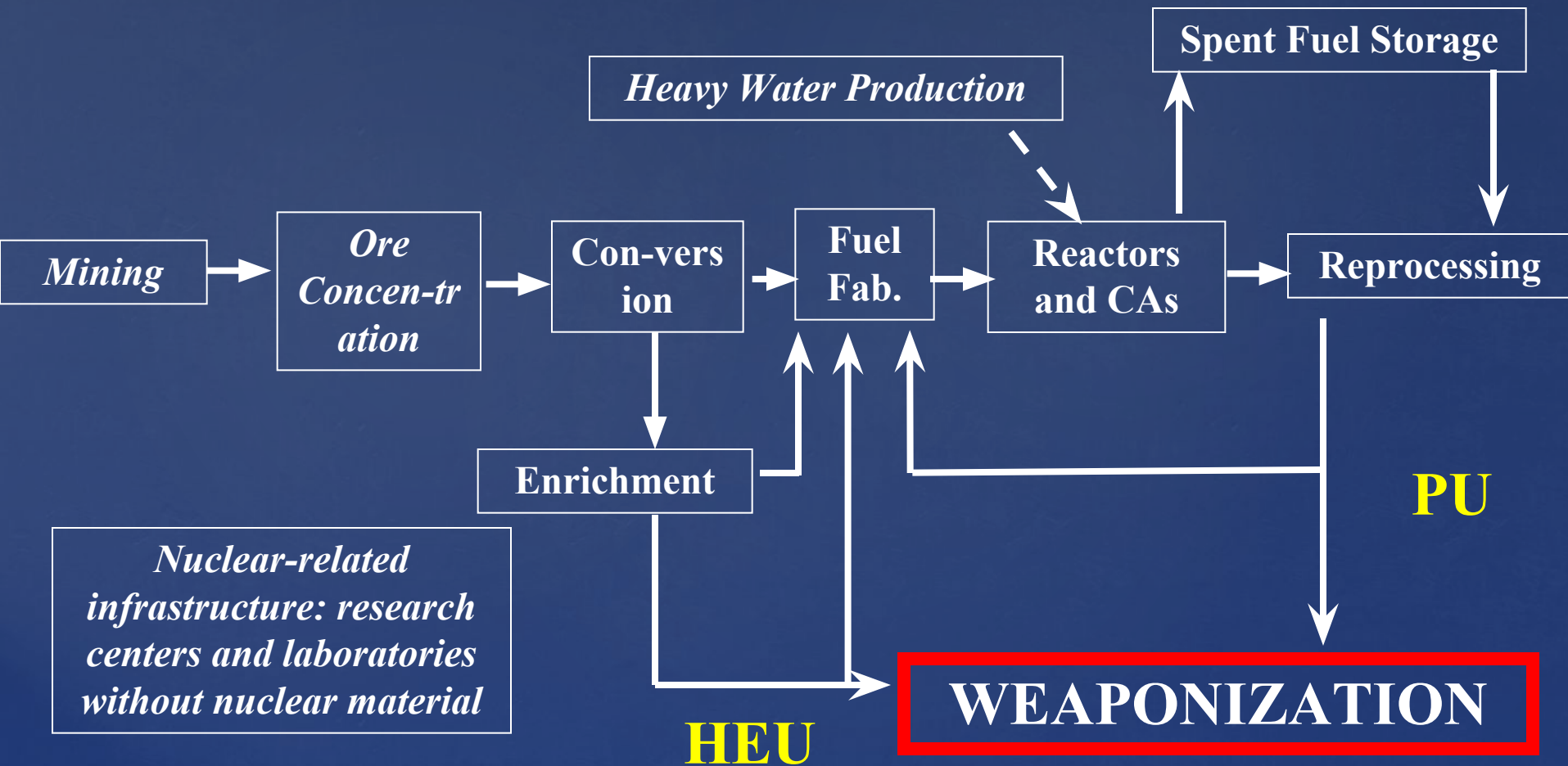
- Voluntary Offer Agreements (VOAs)

- The 5 NPT NWSs: China, France, Russia, UK, US

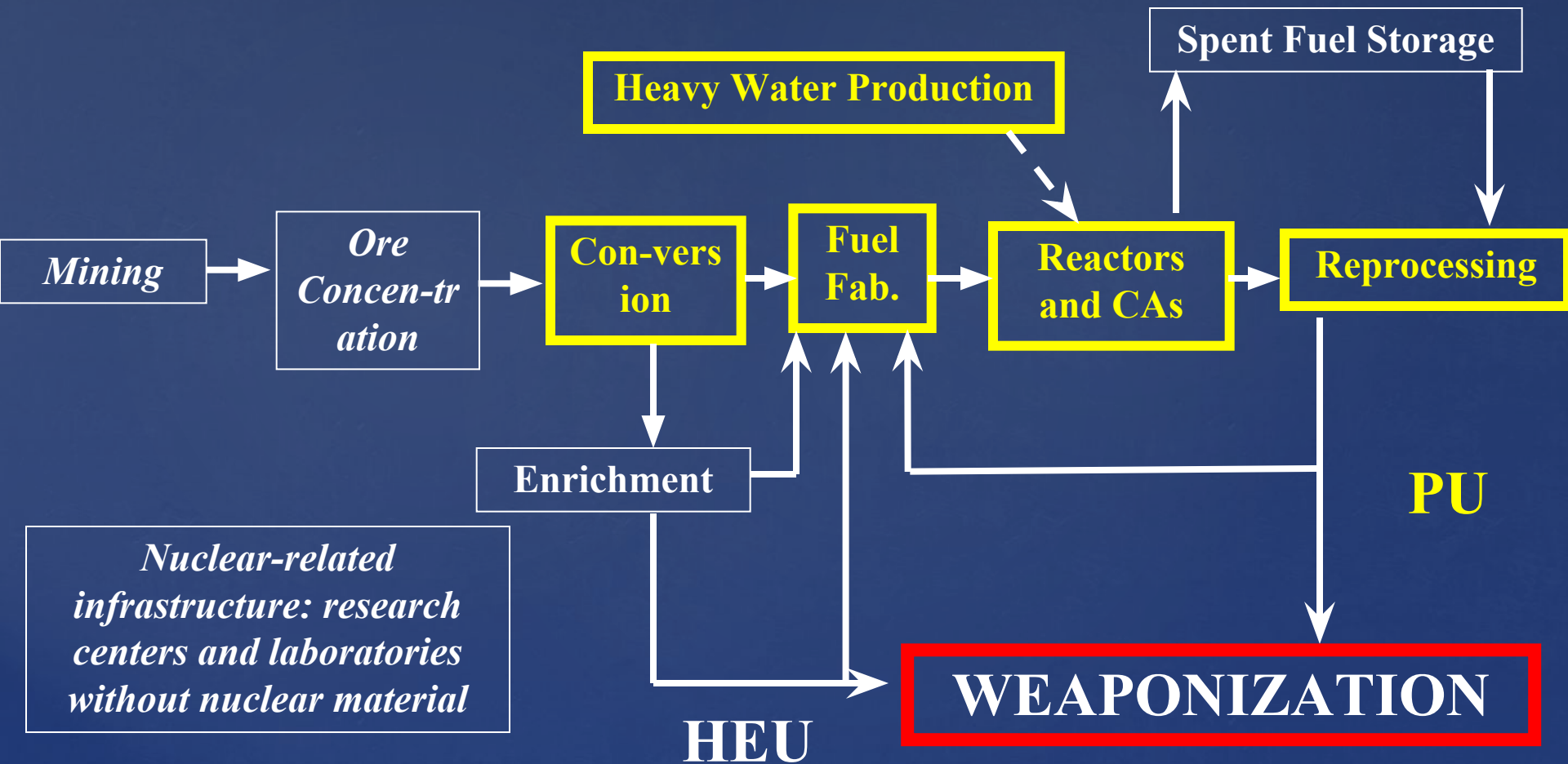
- Comprehensive Safeguards Agreements (CSAs) (INFCIRC/153-type)

- In force for 183 of the 186 NNWSs party to NPT; but not implemented in the DPRK

Critical Path to Weapons-Usable Material



SG Coverage: Item-Specific Agreements



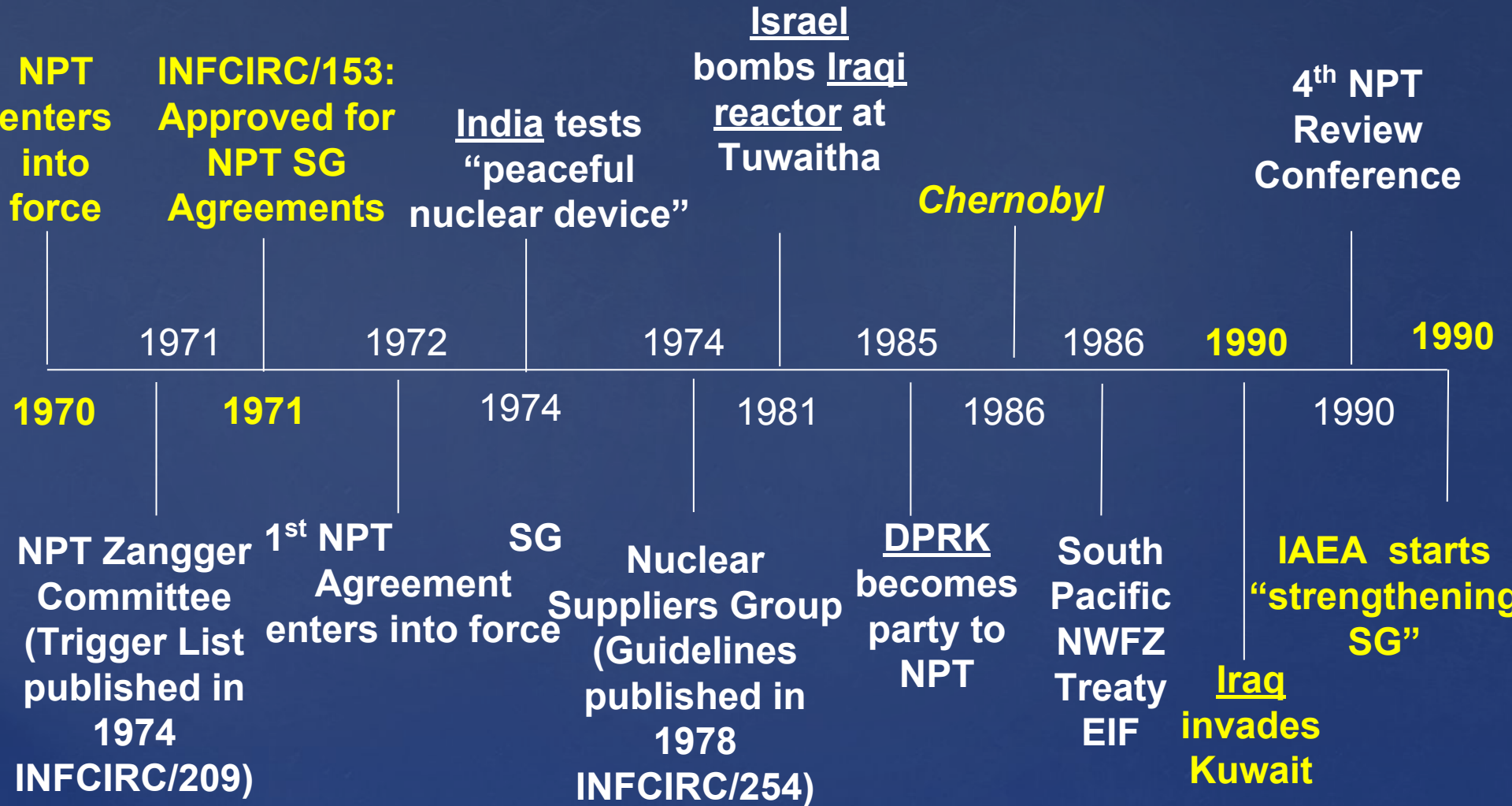
1st NWFZ: Latin America

Tlatelolco Treaty

- Non-proliferation and peaceful use undertakings
- IAEA safeguards on all nuclear activities
- Ban on nuclear testing
- OPANAL - Secretariat
- Protocols:
 - States with territories in the zone
 - NWSs – negative security assurances



The Following Two Decades: The Comprehensive Safeguards System



Challenges of the 1970's – 80's

Perceived Risk?

Misuse of *indigenous* nuclear fuel cycle

Develop safeguards system for verifying **supplied *and* produced nuclear material** in a State

AND

Require **export controls** for nuclear material and specialized ***single use*** equipment and material

The NPT

Nuclear-Weapon States (NWSs)

- Not to provide nuclear weapons or nuclear explosive devices to other States (Art. I)

Non-Nuclear-Weapon States (NNWSs)

- Not to acquire nuclear weapons or other nuclear explosive devices (Art. II)
- Accept safeguards on all nuclear material (Art. III.1, 4)

All States Parties

- Export controls: nuclear material; single use items (Art. III.2)
 - Facilitate exchange of technology (Art. IV.2)
- Pursue negotiations on nuclear disarmament (Art. VI)

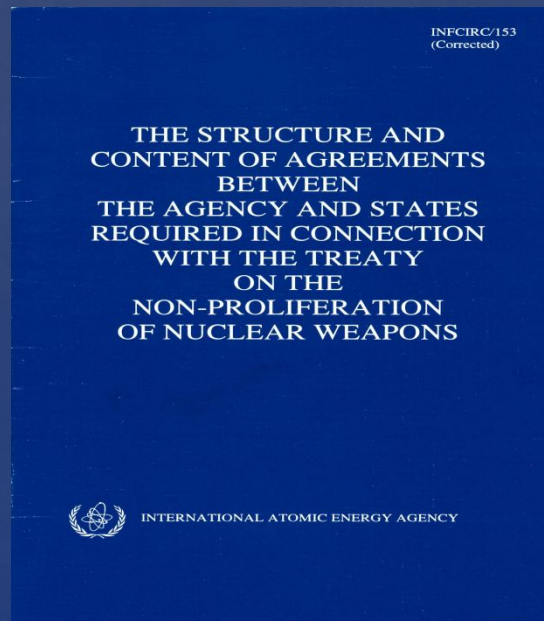
A Walk in the Woods



NPT negotiators George Bunn and Roland Timerbaev circa 1990s, courtesy of Matthew Bunn.

Comprehensive Safeguards Agreements (CSAs)

The Structure and Content of Agreements between the Agency and States required in connection with the Treaty on the Non-Proliferation of Nuclear Weapons INFCIRC/153 (Corr.)



CSA: State's Undertaking

... to accept safeguards, in accordance with the terms of the Agreement, on all source or special fissionable material in all peaceful nuclear activities within the territory of the State, under its jurisdiction or carried out under its control anywhere ...

INFCIRC/153, para. 1

CSA: IAEA's Role

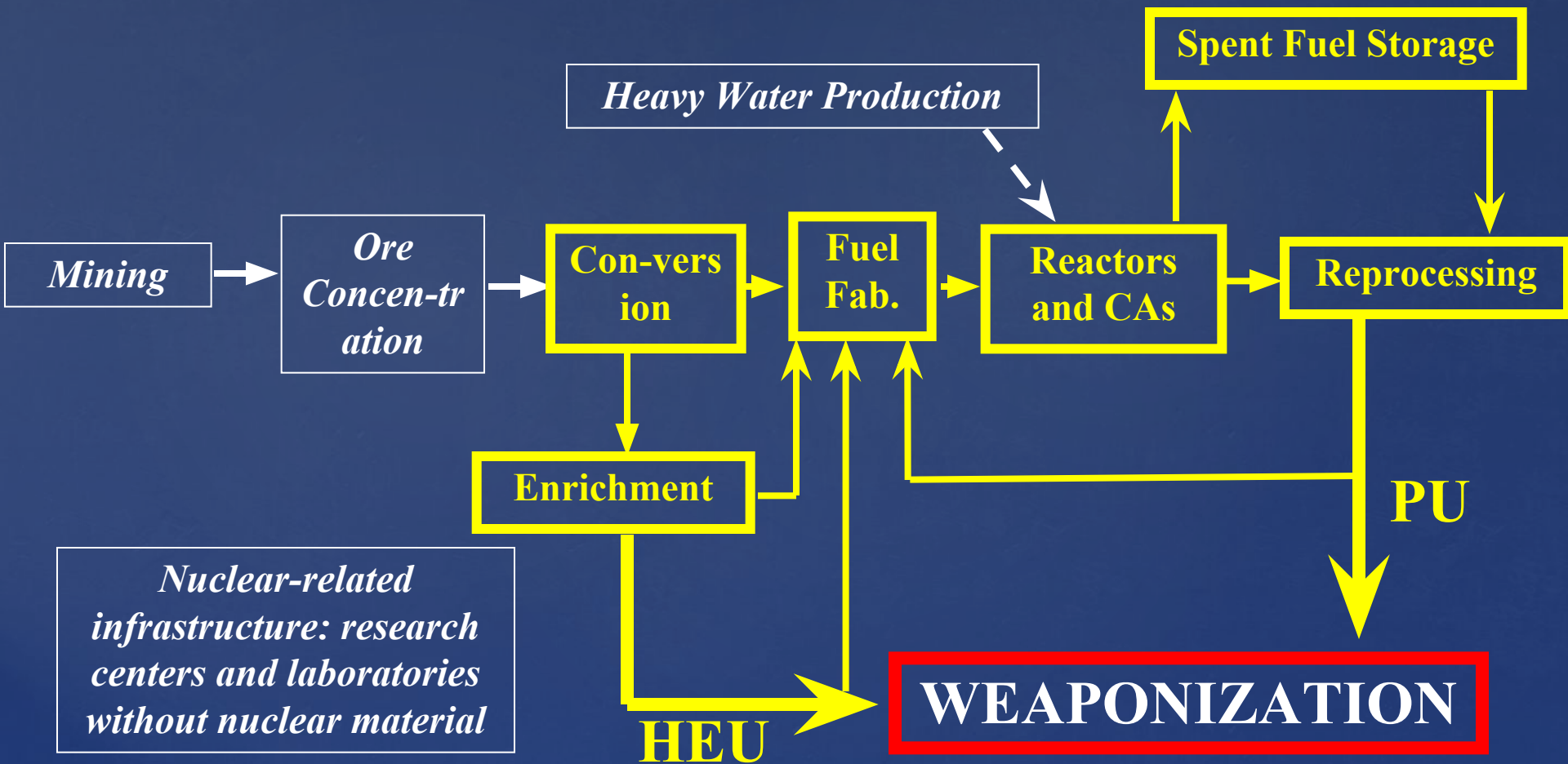
Objective of SG:

- Timely **detection of diversion** of significant quantities of nuclear material to “the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown”
- **Deterrence** of diversion by risk of early detection

Diversion:

- Use of *declared* nuclear material or facilities for proscribed purposes
- Use of *undeclared* nuclear material for proscribed purposes

Routine SG Coverage - CSAs



What if ?

- If **Board decides** an action by the State is “**essential and urgent**” to ensure verification of non-diversion, State is obliged to take that action
(INFCIRC/153, para. 18)
- If Agency is unable to **verify** that there has been **no diversion** of nuclear material, may report to **Security Council** and/or take other action
(INFCIRC/153, para. 19)

Export Controls – NPT & Non-NPT

Zangger Committee (1971) – NPT suppliers

- Trigger List (1974) – Nuclear material and single use items triggering safeguards

(INFCIRC/209)

Nuclear Suppliers Group (1975) – *All* major suppliers

- List of single use items and related technology (1978)

(INFCIRC/254)

Limitations in Traditional SG

- Limited routine *access* – frequency and locations
- Little attention to *small quantities* of material
- Focus on declared materials (*correctness*)
- No assurances of absence of undeclared nuclear material and facilities (*completeness*)

Limitations in Export Controls

Limited **scope and conditions**:

- No requirement for full-scope SG
- No controls on dual-use items or items relevant to weaponization

Limited **information** exchange:

- No procedures for exchanging information on export denials
- No provision of information to the IAEA

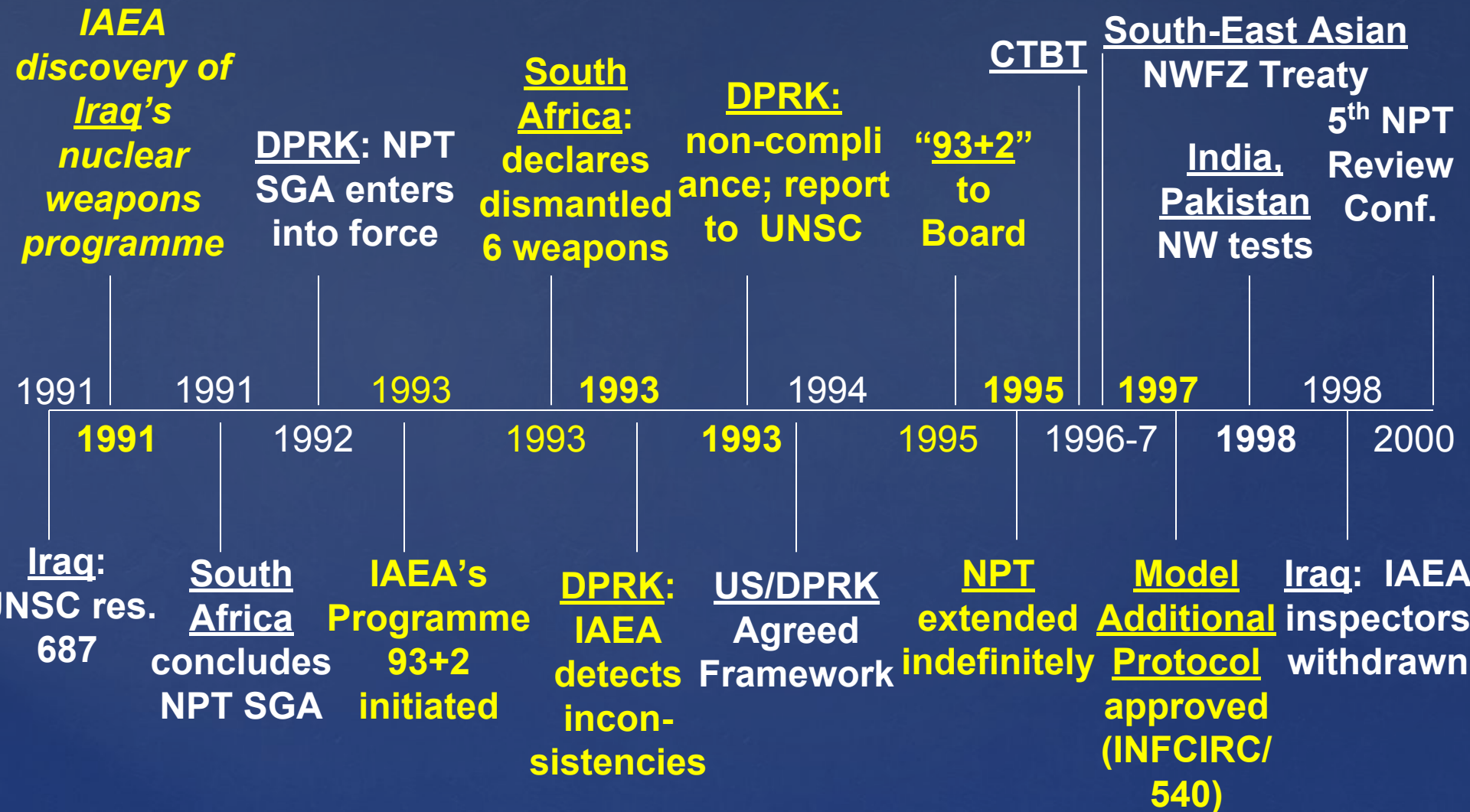
Informal, non-binding

1991: The War That Changed Everything



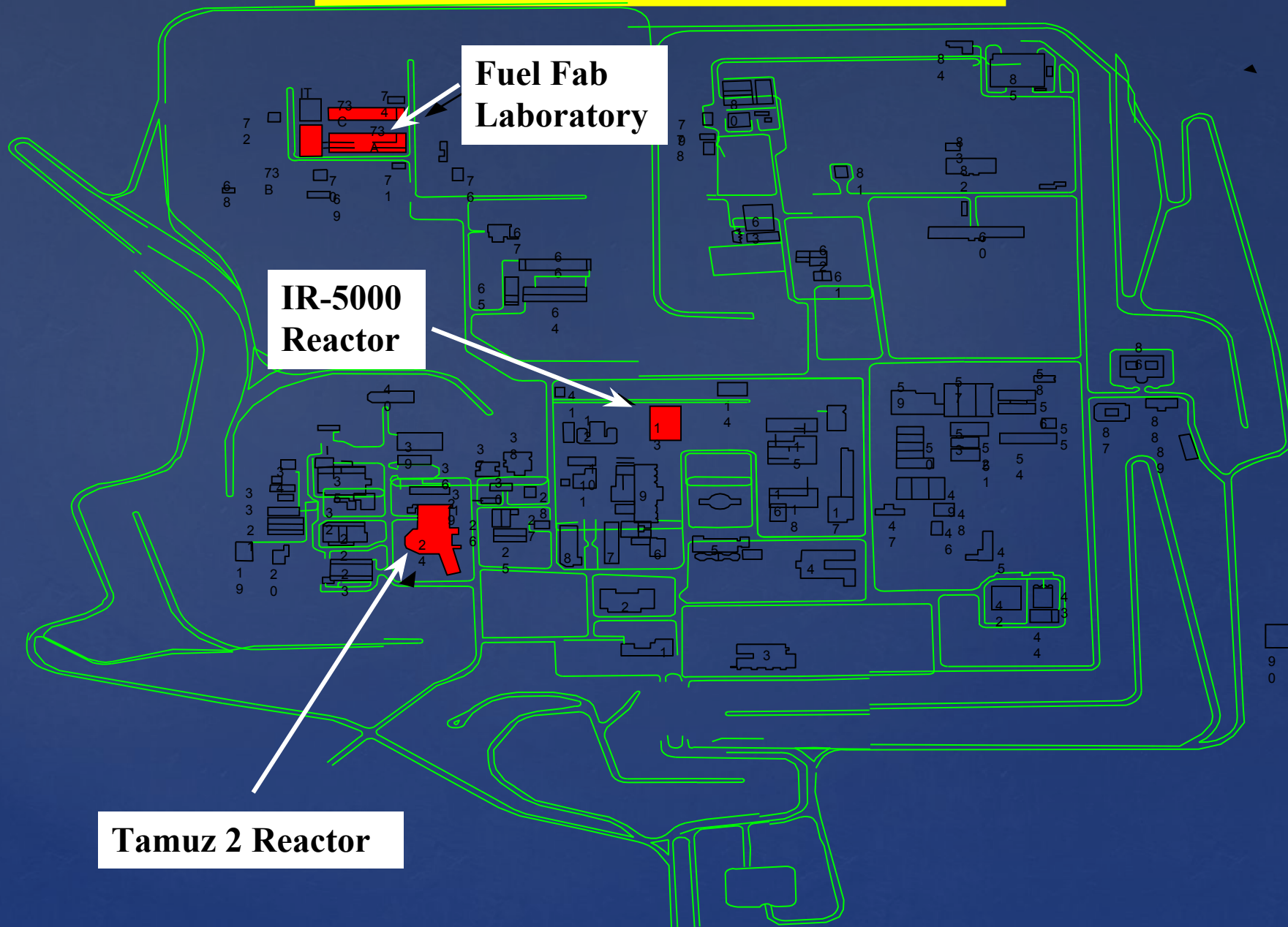
The Next Decade:

Strengthening Safeguards



TUWAITHA

Activities Declared Prior to 1991



TUWAITHA

Clandestine Nuclear Weapons Activities

**Weaponization
explosives;
neutron initiator**

**U metal
production**

**EMIS
activities**

**UCI4
production
lab**

**Planned U metal
production**

**Clandestine
isotope
irradiation**

**R&D on
UF4 & UF6
production**

**Tritium activities;
HEU recovery
(crash programme)**

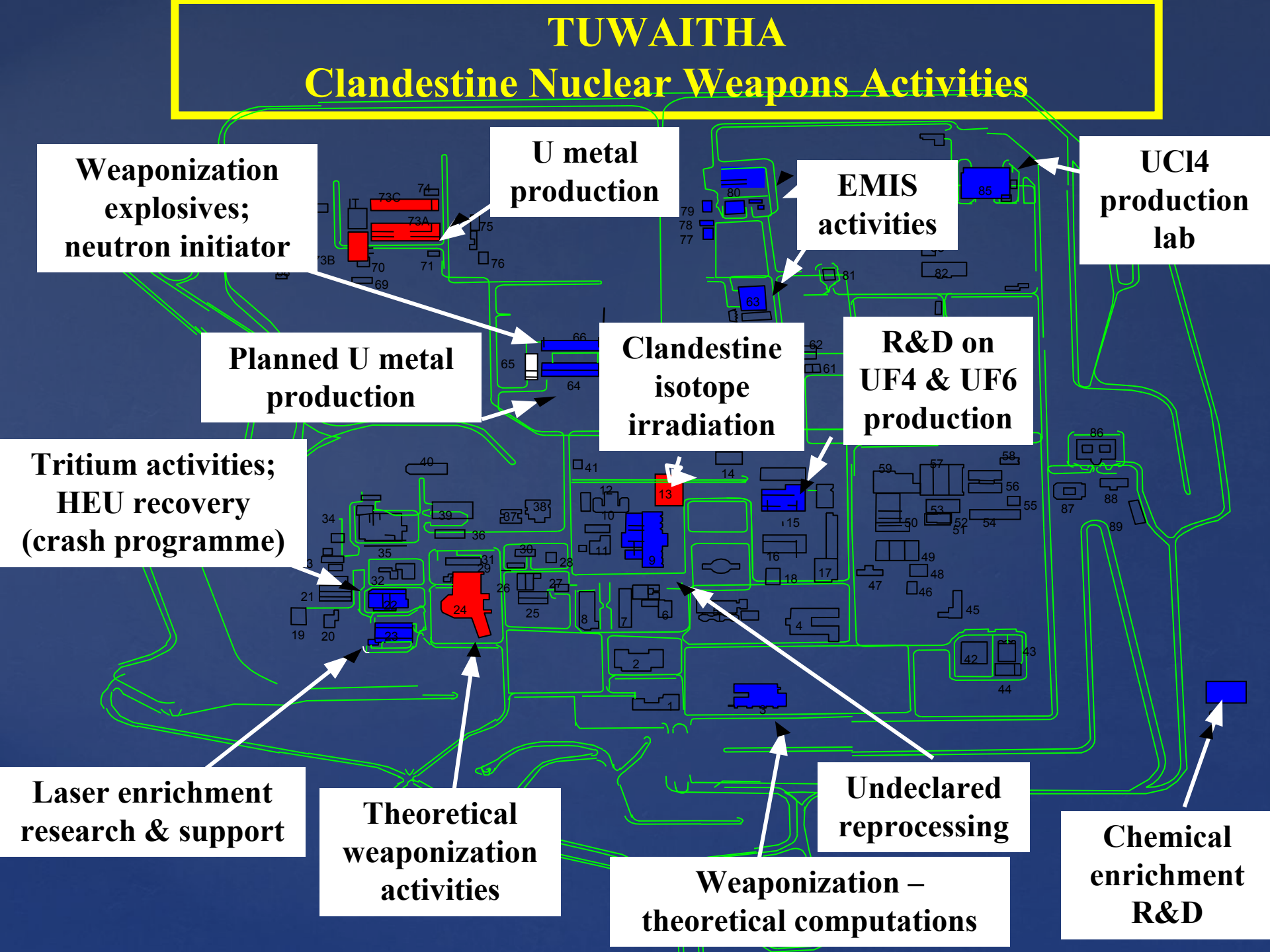
**Laser enrichment
research & support**

**Theoretical
weaponization
activities**

**Weaponization –
theoretical computations**

**Undeclared
reprocessing**

**Chemical
enrichment
R&D**



Challenges of the 1990's

Perceived Risk?

Undeclared **nuclear material and activities**

Ensure verification of all nuclear material and activities: **declared** and the **absence of undeclared**

AND

Expand export controls to cover **dual use items**

CSAs: Shifting Perceptions

... the Agency's right and obligation to ensure that safeguards will be applied ... on **ALL** source or special fissionable material in all peaceful nuclear activities within the territory of the State, under its jurisdiction or carried out under its control anywhere ...

INFCIRC/153, para. 2

Redefined Objective

Assurances of *Correctness* and
Completeness of a State's
Declarations

1991-1997: Challenging Years



Strengthening IAEA SG

Measures under safeguards agreements

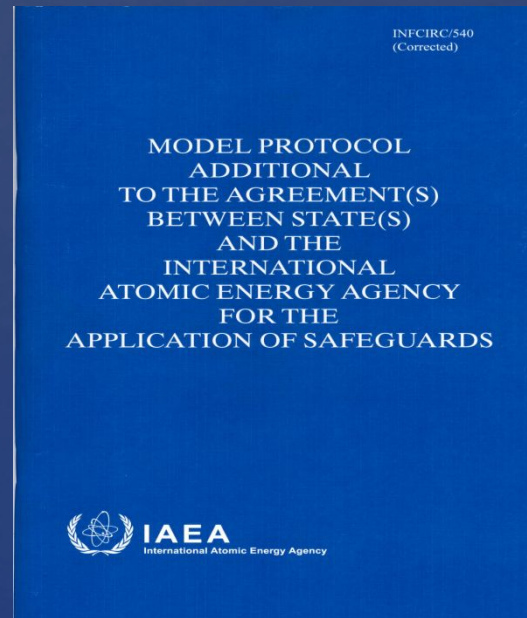
- Agency access to undeclared locations
- Early provision of facility design information
- Environmental sampling
- Use of satellite imagery
- Evaluation of SG for the State as a whole

Measures requiring additional authority

- Additional information
- Broader access
- Simplified administrative procedures

Model Additional Protocol

Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards INFCIRC/540 (Corr.)



What's new?

Additional Information

- All parts of the nuclear fuel cycle, not just nuclear material and facilities

Complementary Access

- To places beyond nuclear material and facilities
- Short notice (2/24 hours)
- Managed access to protect sensitive information

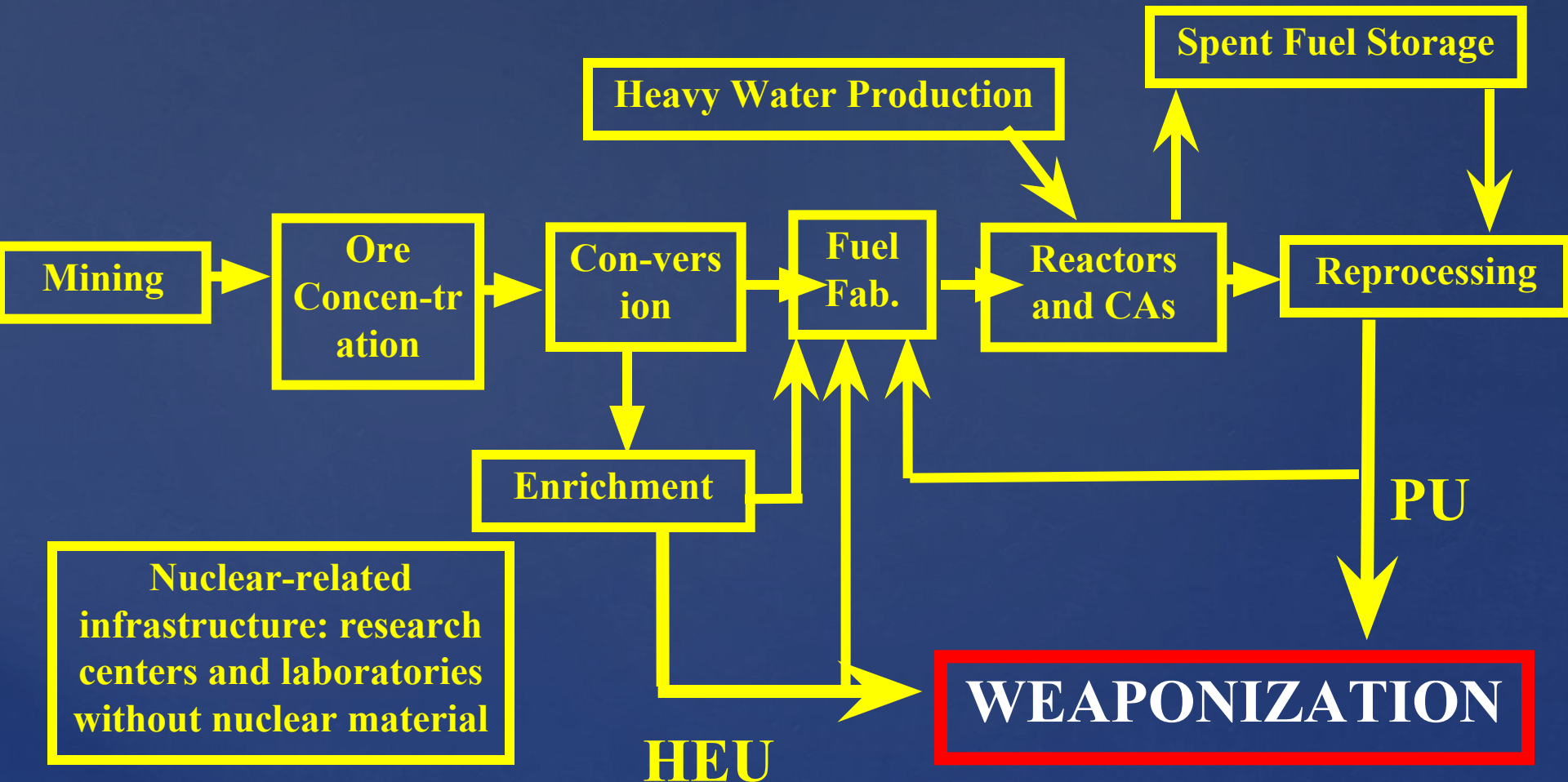
Administrative Measures

- Simplified inspector designation
- Reduced visa requirements

What's NOT new?

- Agency's right to carry out **unannounced inspections** (INFCIRC/153, para. 84)
- Agency's right to request **access to undeclared locations** (INFCIRC/153, para. 73, 77)
- Agency's right to verify **correctness and completeness** (INFCIRC/153, para. 2)

SG Coverage – CSA and AP



Export Control Developments

INFCIRC/254:

- Part 1 (1978): “EDP” items, and technology transfer
- Part 2 (1992): Dual-use equipment, material and technology
- Conditions:
 - ◆ “Full scope” SG as condition for future supplies (1992)
 - ◆ Exchange within NSG of notifications of denials

INFCIRC/539 (Rev.8): Outreach activities

1997: “The Nuclear Suppliers Group: Its Origins, Role and Activities” – revised in 2000, 2003, 2005, 2009, 2012, 2015, 2019 and 2022

1995 NPT Review & Extension Conference

- No agreement on a “Final Document”
- NPT extended indefinitely – a package deal – three decisions & a resolution:
 - **Decision I**: Strengthened review process
 - **Decision II**: “Principles and objectives for nuclear nonproliferation and disarmament”, including negotiate comprehensive nuclear test ban by 1996 & begin negotiations on a fissile material treaty
 - **Decision III**: Indefinite extension
 - **Resolution on the Middle East**

1995 NPT Review & Extension Conference

ME resolution sponsored by US, UK, RF:

- Reaffirmed the importance of NPT universality
- Called on all States in the ME “to take **practical steps**...aimed at making progress towards, inter alia, the establishment of an effectively verifiable Middle East zone free of WMD & their delivery systems”
- Called on all NPT members, in particular the NWSs, to cooperate and exert their utmost efforts to achieving that goal

2000 NPT Review Conference

- Fully negotiated, comprehensive and forward-looking Final Document
- 13 Practical Steps for systematic and progressive efforts to implement Article VI (disarmament)
- Importance of the New Agenda Coalition

9/11

"All the News
That's Fit to Print"

The New York Times

Late Edition

New York: Today, sunny, a few afternoon clouds, High 77. Tonight, slightly more humid, Low 65. Tomorrow, sun then clouds, High 81. Yesterday, High 81, Low 63. Weather map, Page C18.

VOL. CL . . . No. 51,874

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NEW YORK, WEDNESDAY, SEPTEMBER 12, 2001

\$1 beyond the greater New York metropolitan area

75 CENTS

U.S. ATTACKED

HIJACKED JETS DESTROY TWIN TOWERS AND HIT PENTAGON IN DAY OF TERROR

A CREEPING HORROR

Buildings Burn and Fall
as Onlookers Search
for Elusive Safety

By N. R. KLEINFIELD

It kept getting worse.

The horror arrived in episodic bursts of chilling disbelief, signaled first by trembling floors, sharp eruptions, cracked windows. There was the actual unfathomable realization of a gaping, flaming hole in first one of the tall towers, and then the same thing all over again in its twin. There was the merciless sight of bodies helplessly tumbling out, some of them in flames.

Finally, the mighty towers themselves were reduced to nothing. These plumes of smoke raced through the downtown avenues, swirling between the buildings, shaped like tornadoes on their sides.



President Vows to Exact Punishment for 'Evil'

By SERGE SCHMEMMANN

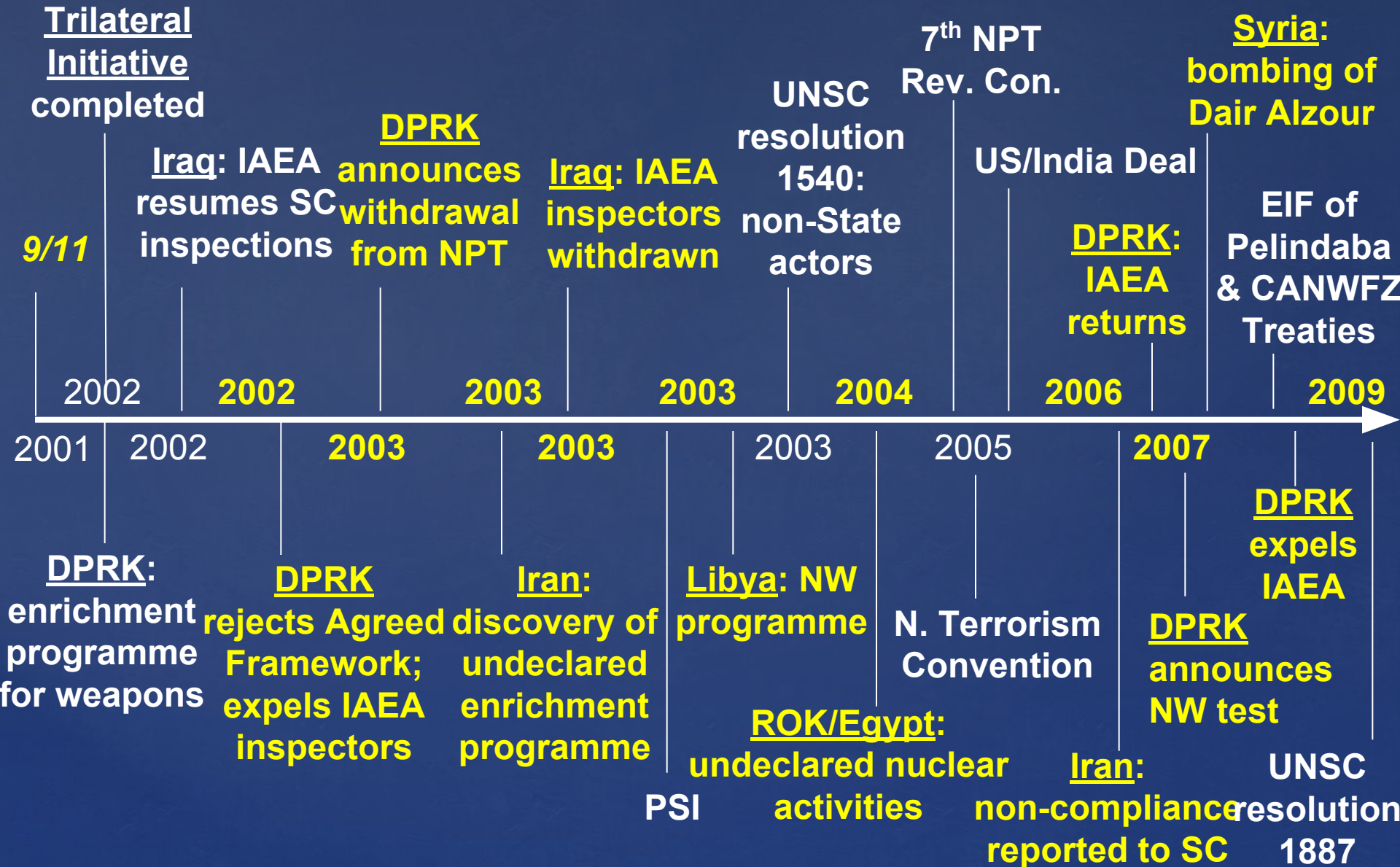
Hijackers rammed jetliners into each of New York's World Trade Center towers yesterday, toppling both in a helish storm of ash, glass, smoke and leaping victims, while a third jetliner crashed into the Pentagon in Virginia. There was no official count, but President Bush said thousands had perished, and in the immediate aftermath the calamity was already being ranked the worst and most audacious terror attack in American history.

The attacks seemed carefully coordinated. The hijacked planes were all en route to California, and therefore gorged with fuel, and their departures were spaced within an hour and 46 minutes. The first, American Airlines Flight 11, a Boeing 767 out of Boston for Los Angeles, crashed into the north tower at 8:48 a.m. Eighteen minutes later, United Airlines Flight 175, also headed from Boston to Los Angeles, plowed into the south tower.

Then an American Airlines Boeing 757, Flight 77, left Washington's Dulles In-



The New Millenium (Part 1)



Challenges of the Early 2000's

Perceived Risk?

Non-State actors & radiological dispersal devices

Improve physical **security** of **nuclear material** & ***other radioactive materials*** and ***facilities***

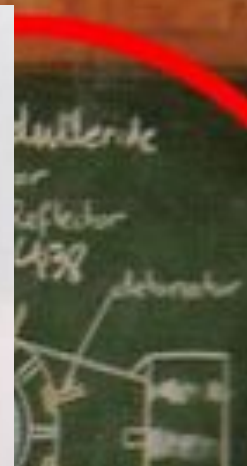
AND

Ensure effective **trans-border** & **domestic** **controls**

Safeguards vs. Security

- **Nuclear safeguards:**
 - Detection and deterrence of diversion of nuclear material by a State
- **Nuclear security:**
 - Detection and deterrence of misuse of nuclear material & other radioactive substances, and facilities, by non-State actors

2002-2009: More Challenges



IAEA to
Monitor
& Verify
Shutdown
of DPRK's
Nuclear
Facility



2005 NPT Review Conference

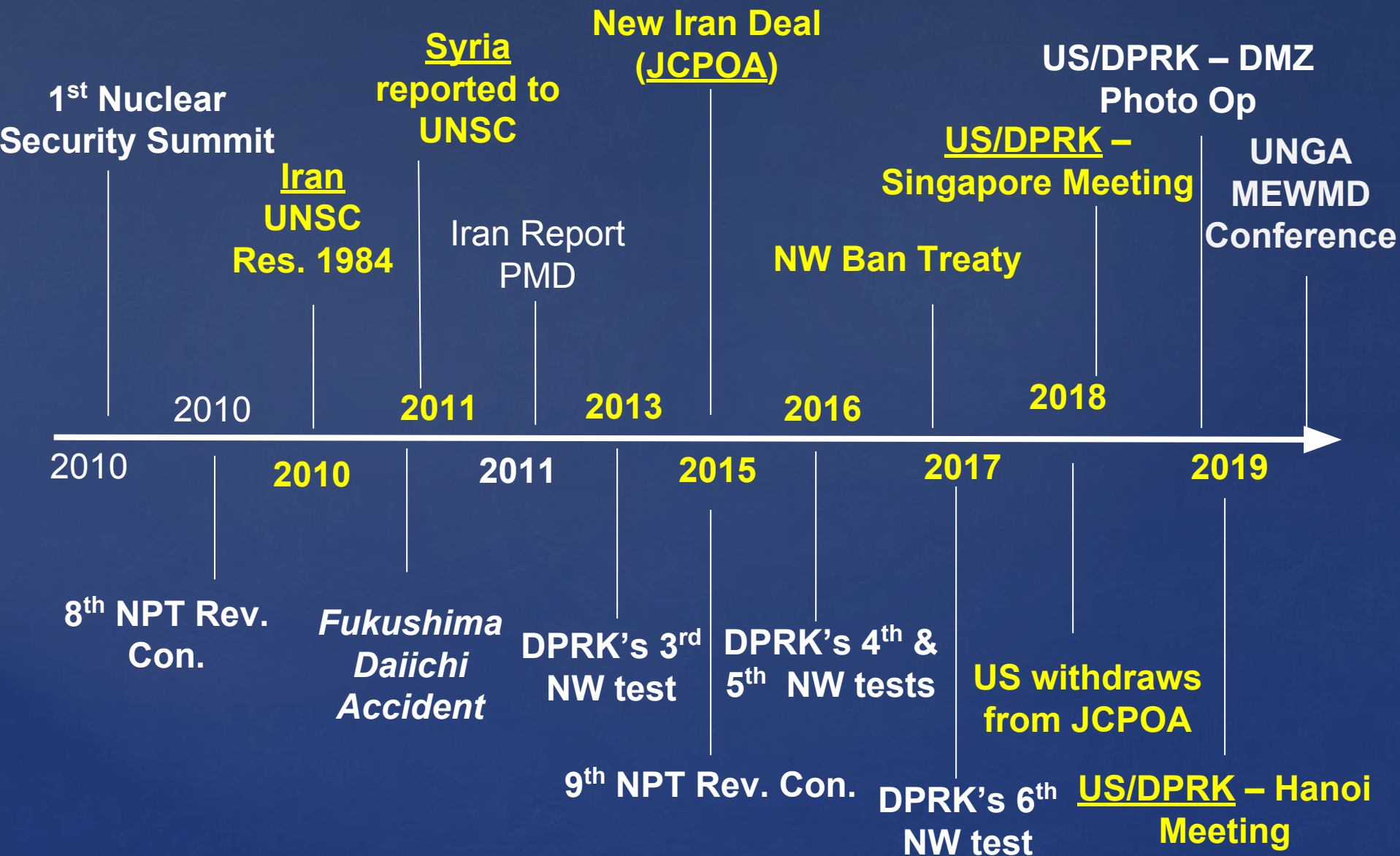


- Three weeks of arguments on the agenda
- Disagreements on Middle East, disarmament, negative security assurances, compliance & safeguards
- **No Final Document**

Nobel Peace Prize – 2005



The New Millenium (Part 2)



Challenge of the 2010's

“It was the best of times, it was the worst of times...” *

* Charles Dickens, “A Tale of Two Cities”

2010 NPT Review Conference

- “Arms Control Spring”
 - Prague Speech
 - New Start
 - Nuclear Security Summit
- Compromise: separate “review” & “forward looking” sections of the Final Document
- **Conclusions & recommendations on “action plan” across the 3 NPT pillars**
- **Called for ME Conference before end of 2012**
- **Recognition of catastrophic humanitarian consequences of nuclear weapons use**

IRAN & PMD: 2011 – 2013





Iran Revisited: 2013 – 2016

- **JCPOA & IAEA'S Roadmap for Clarification** 14
July 2015

- **UNSC 2231** – 20 July 2015

- **Past & present outstanding issues** – 15 December 2015

- **Implementation Day** 16
January 2016

□ **US Withdrawal**

8 May 2018



2015 NPT Review Conference

- Middle East: 2012 conference never convened
- Small group negotiations on disarmament - no consensus
- Humanitarian discourse – vitriolic on both sides
- Deep divisions on legitimacy of nuclear weapons, need for new legal instruments



- **Disagreement on ME**
- **No Final Document**

The TPNW (Ban Treaty)

- **2016 Open Ended Working Group**: “to substantively address concrete effective legal measures, legal provisions and norms that will need to be concluded to attain and maintain a world without nuclear weapons ...”
- **Three sessions** (February, May, August 2016) – no NW possessors attended
- **OEWG recommends commencing negotiations in 2017 to prohibit nuclear weapons**
- **2016 UN First Committee: NW ban resolution** sponsored by Austria, Brazil, Ireland, Mexico and others
- 20 days of negotiation in NY, March 2017, June-July 2017
- 130 States, ~100 civil society organizations
- **Text adopted: 7 July 2017**
- 122 yes; 1 no (Netherlands); 1 abstention (Singapore)
- **Entry into force: 22 January 2021**

US/DPRK Relations



September 2017

June 2019



File photo from The Independent

Approaching 2020: The NPT at 50

- **Disarmament:** rather the lack thereof
- **ME WMD Free Zone:** what next?
- **Ban Treaty:** impact on the negotiations
- **Iran:** consequences of US withdrawal
- **DPRK:** who knows?

Meanwhile, ...

Bugs, Bombs, Subs & Politics

**Coronavirus
Pandemic**

**Russian Invasion of
Ukraine**

10th NPT RevCon finally!

**DPRK – destroys Joint
Liaison Office**

US national elections

2021

2022

2024

2020

2023

**AUKUS
announced**

**Brazil/IAEA
subs talks**

**DPRK –
nuclear-armed status
irreversible**

**10th NPT
RevCon
postponed**

**10th NPT
RevCon
postponed
AGAIN**

1st NPT Prep Com

2nd NPT Prep Com

Subs & Safeguards



2022: The NPT at 50+2

- AUKUS
- DPRK
- Iran
- Ban Treaty
- Middle East WMD Free Zone
- ◆ Ukraine/Russia



2025: Changing of the Guard



Future Challenges?

Ukraine/Russia – global implications?

US/Russia/China relations – a new [Cold] War?

Emerging & hybrid technologies (AI, SMRs, fusion, additive manufacturing) – the good, the bad, the ugly

Outer space – prospects for arms control?

Iran – will it remain in the NPT?

Disarmament – lack of progress, backsliding

US – unpredictability of US Administration; NATO

The non-proliferation regime – can it survive?

If the NPT collapses ...

- **All but a handful of IAEA safeguards agreements will cease to be in force**
- **Will JFK's prediction come true?**

Today's Regime....

Disarmament

Security

NPT & NWFZ Treaties

Security Council

IAEA Safeguards



Assurances of Supply

Export controls

Safety

Counter Proliferation

Security Assurances