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Joint ICTP-IAEA School of Nuclear Energy Management

5 - 23 November 2012

Overview of the International Safeguards System and Implementation

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THE IAEA NUCLEAR ENERGY (POLICY) MANAGEMENT SCHOOL

Trieste, Italy, 5-23 Nov. 2012

Overview of the International Safeguards System and Implementation

K. Dinov - IAEA

Division of Concepts and Planning

Safeguards Training Section

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International Atomic Energy Agency

Outline

- Evolution of the international safeguards system
- IAEA safeguards: goals and objectives
- Developments of safeguards implementation focusing on the State-level concept
- Enhancing the effectiveness and efficiency of the safeguards system

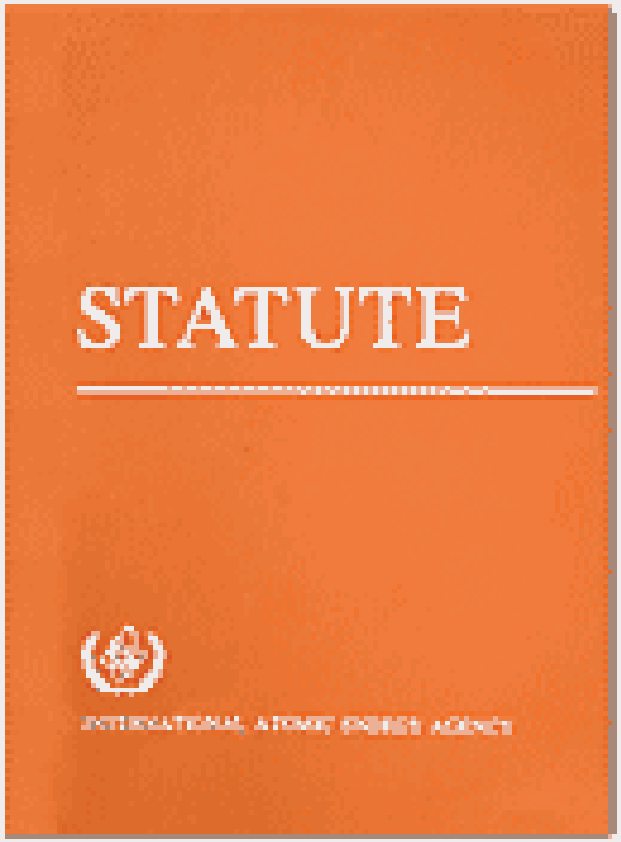
Genesis of Safeguards System

- 1945 – joint declaration of USA, UK and Canada (first mention of safeguards)
- 1954 – USA decides on concluding nuclear cooperation agreements under condition of applying safeguards
- 1957 – creation of IAEA
- IAEA Statute: development and control

Provisions of IAEA Statute – Mandate

- Article III.A.5:

"…to establish and administer safeguards designed to ensure that special fissionable and other materials, services, equipment, facilities and information …are not used in such a way as to further any military purpose"



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Safeguards?– need for Comprehensive SG agreement

- **1961:** INFCIRC/26: "Agency safeguards" means the measures pursuant to the Statute to prevent loss or diversion of materials, specialized equipment or principal nuclear facilities.
- INFCIRC/66 reflected situation of the late 1940s – 1950s
- In 1960s some “non-nuclear” States had already had indigenous nuclear activities
- Comprehensive system covering all nuclear activity in a State was needed

NPT Treaty - entered into force in 1970

- Safeguards to prevent diversion from peaceful uses
- Balanced obligations between NNWS and NWS
- Full access to peaceful uses of nuclear energy
- Security assurances

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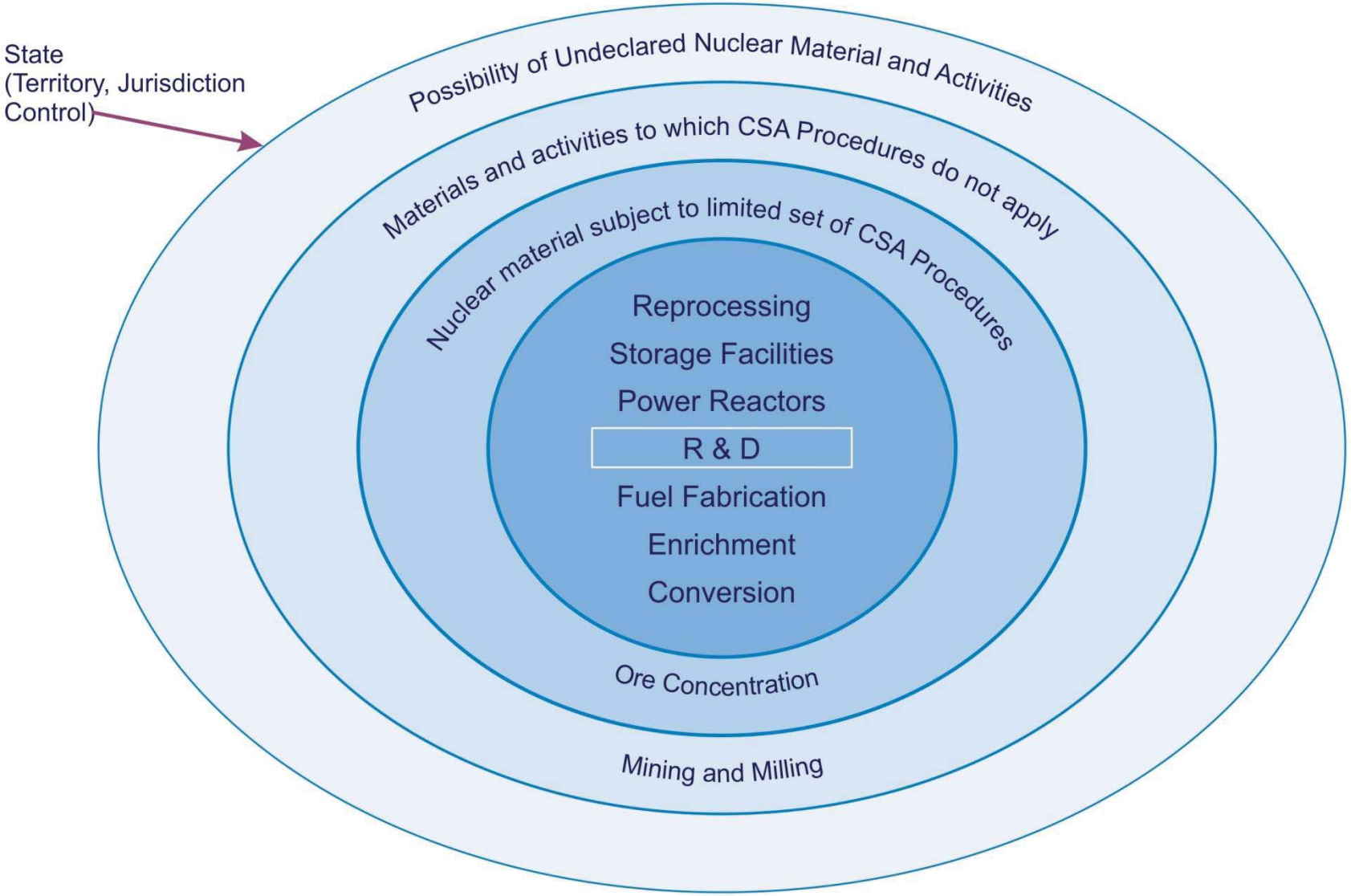
Comprehensive Safeguards Agreements

- Concluded with States party to NPT and/or Nuclear Weapons Free Zones (NWFZ)
- Presently in force with about 170 States
- **Safeguards apply to all nuclear material in the State (Para. 2) – INFCIRC/153**

Safeguards Coverage under CSA – is that enough?



Comprehensive Safeguards Agreements (CSA)

State establishes and maintain a **System** of **Accounting for and Control** (**SSAC**) of nuclear material and supplied information to the IAEA:

- Nuclear material accountancy reports
- Design information

IAEA verification/inspections:

- Comparison of operator records with State's nuclear material accountancy reports
- Verification of declared nuclear material and facilities

Challenges of the 1990s

1991: Iraq – How to deal with undeclared activities?
1993: Programme 1993 + 2
1993/94: Safeguards regime strengthened at R&D installations
1995: the Board reiterated that the safeguards system for implementing comprehensive safeguards agreements should be designed to provide for verification by the Agency of the correctness and completeness of States' declarations so that there is **credible** assurance of the non-diversion of nuclear material from declared nuclear activities and of the absence of undeclared nuclear material and activities.

Additional Protocol – INFCIRC/540

- Approved in 1997
- Provides additional tools to verify the State's compliance
- State's obligations under AP:
  - Provide information additional to that required under CSA
  - Provide complementary access to relevant locations in the State additionally to those declared under CSA

Safeguards System Evolution: Overview

- **Legal basis**: from item-specific agreements - to NPT, CSA and AP
- **Underlying concept**: from attempt to safeguard nuclear knowledge, technology and material, - to verification of compliance of States with their undertakings; State-level concept;
- **Safeguards measures**: from accountancy verification – to complementary access and State evaluation

State-level Concept

- Developed during first decade of 2000
- Represents a broader concept: Integrated Safeguards is a specific case of the State-level concept
- Verification objectives are established starting at State level: top-down approach
- Safeguards conclusion is drawn for the State as a whole

State-Level Concept

- A holistic approach to safeguards implementation
  - Applicable to all States with SG agreements
  - Based on a comprehensive and continuous State evaluation and a State-level approach
  - Executed through an annual implementation plan
- Considering the State as a whole provides the opportunity to take State-specific factors into consideration during all stages of safeguards implementation
- Implementation of the State-level concept is responsive to changes in the analysis, ensuring that safeguards conclusions remain soundly based and up-to-date

Evolving Safeguards Implementation

Evolving safeguards implementation to be **more:**

- **Objectives based:** As opposed to criteria driven; allows for customized State-level approaches to meet State-specific objectives
- **Information driven:** Use of all information, including State factors, to determine objectives and safeguards activities

➢ **Focused:** At the State level and on issues of concern; directing resources to identified risks

➢ **Adaptable:** Responsive to changes in information and analysis

➢ **Less predictable:** Timing and nature of verification activities varies

Objectives-Based Safeguards

- **State-level objectives** are pursued to verify States' compliance with their safeguards obligations, with underlying technical objectives established to achieve them
- **Technical objectives**
  - Focused on detecting elements of the plausible acquisition paths
  - Form the basis for identifying applicable safeguards measures in the State-level approach

State-level Objectives under CSA

A: Detect undeclared nuclear material and activities (anywhere in the State)

B: Detect undeclared production or processing of nuclear material at declared facilities and LOFs

C: Detect diversion of declared nuclear material (confirm that declared nuclear material has been adequately accounted for, i.e. verify SSAC findings)

Verification activities should be performed in timely manner to provide deterrence due to risk of early detection

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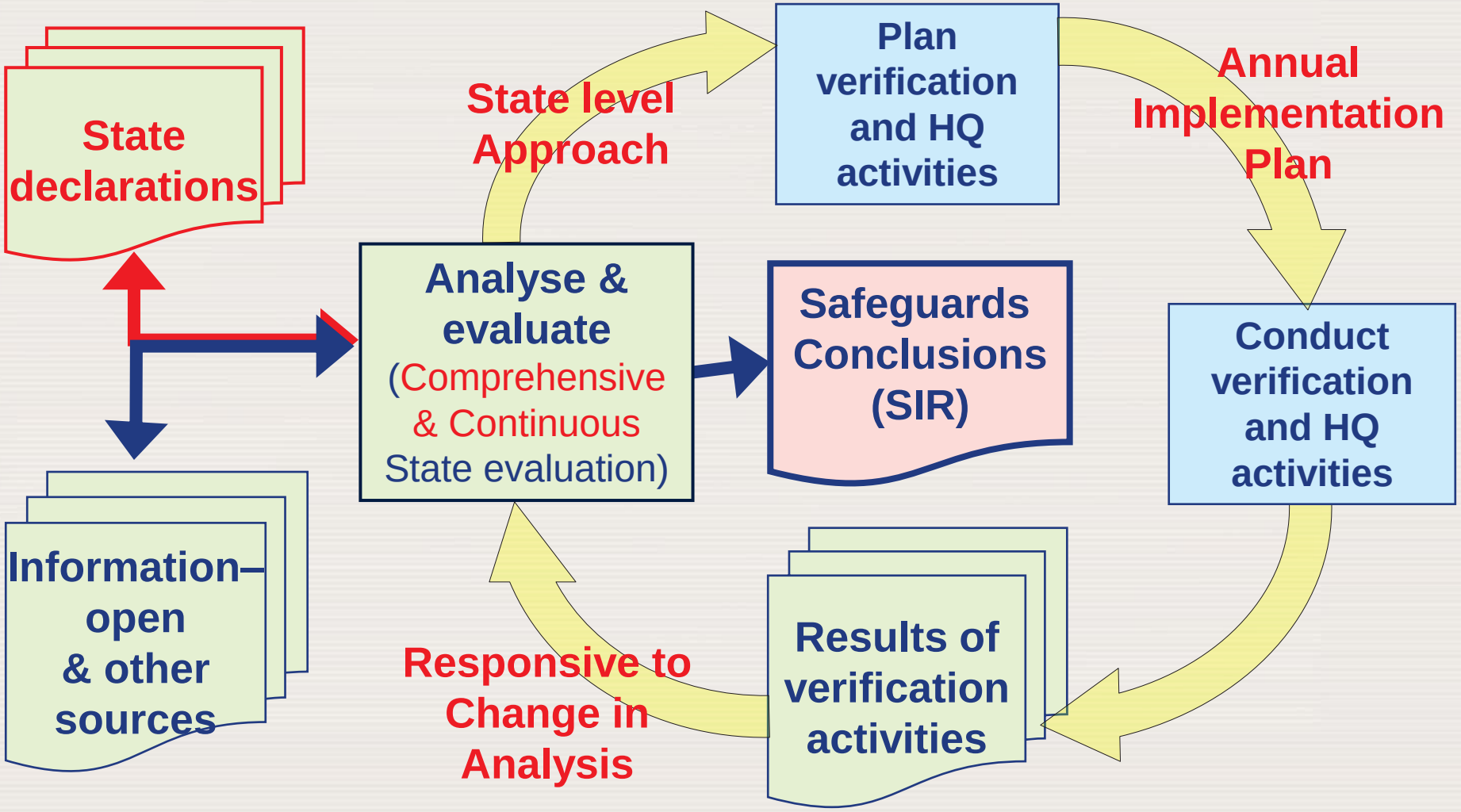
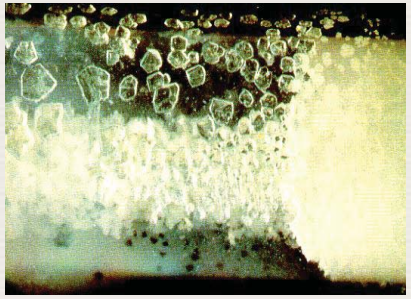
Summary: Safeguards Implementation



Nuclear Fuel Cycle and Nuclear Material





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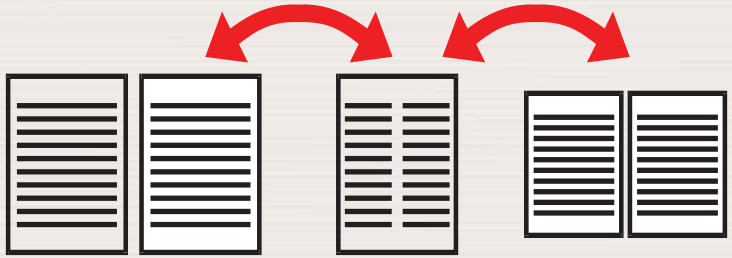
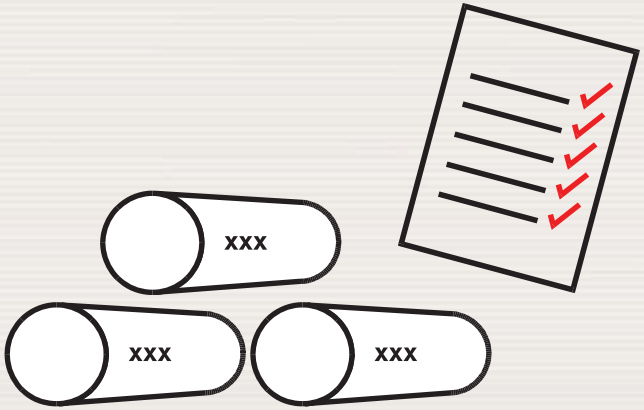
Nuclear Material Accountancy

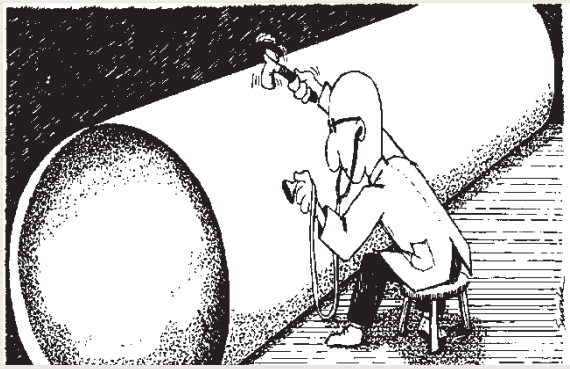
Records Examination



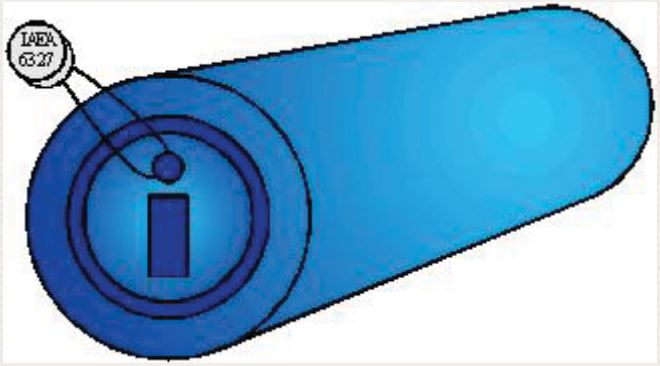
Item Counting and identification



Measurements



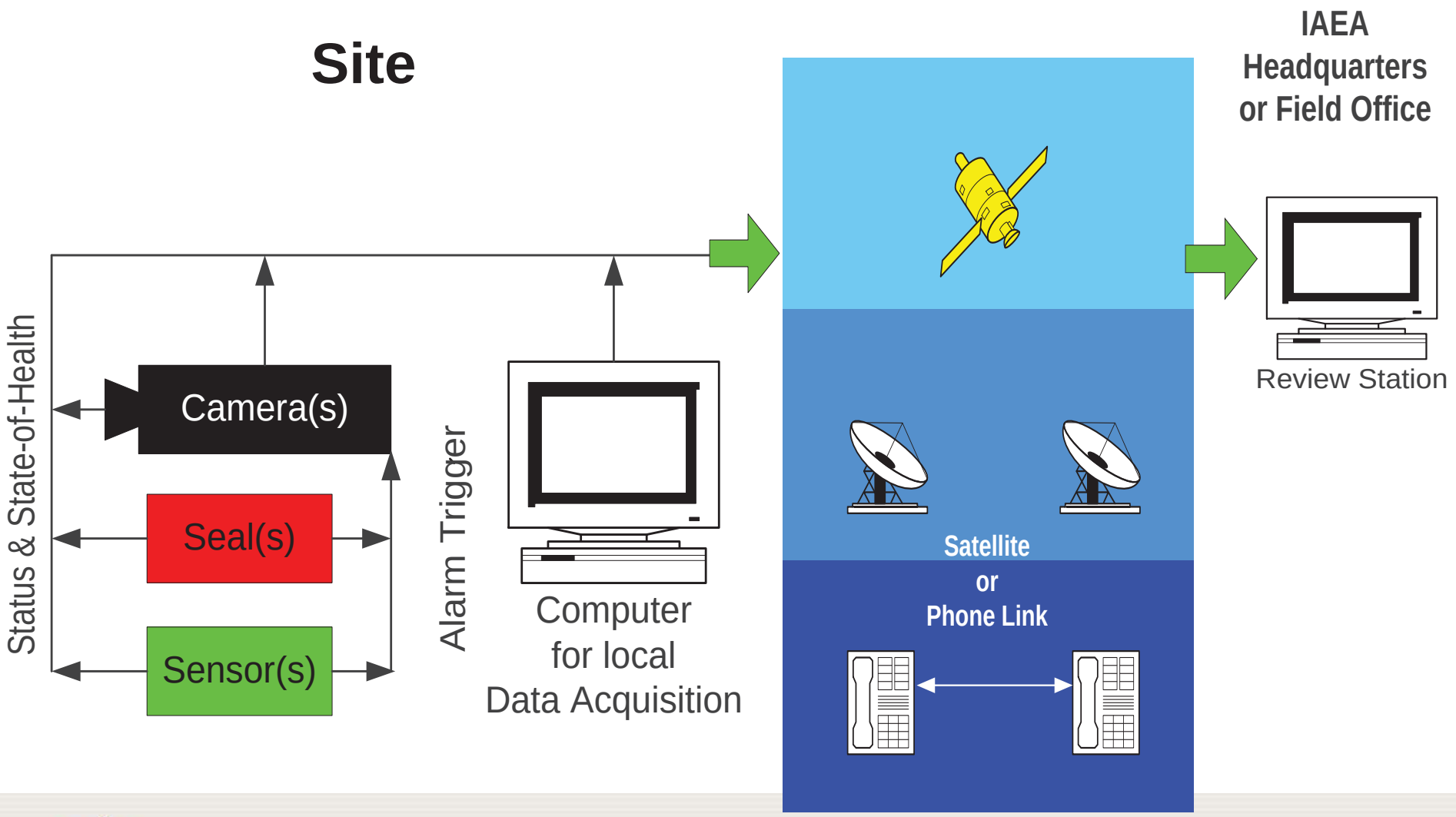
Containment and Surveillance (C/S)



Seals

Cameras/Video

Remote Monitoring



Design Information Verification (DIV)

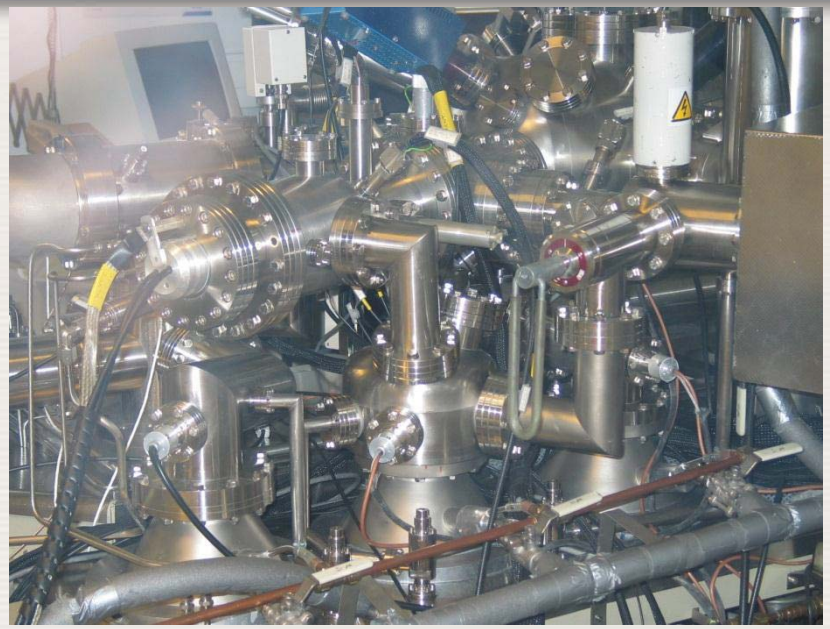
Objectives:

- To verify the validity of the design information provided by the State.
- To design and verify the validity of the safeguards approach applied at the facility.
- To detect any misuse of the facility.

Environmental Sampling

Environmental sampling is based on the premise that every nuclear process, no matter how leak tight, emits small amounts of process material to the environment.

Complementary Access at R&D facilities



Is it of safeguards significance?

What is it?

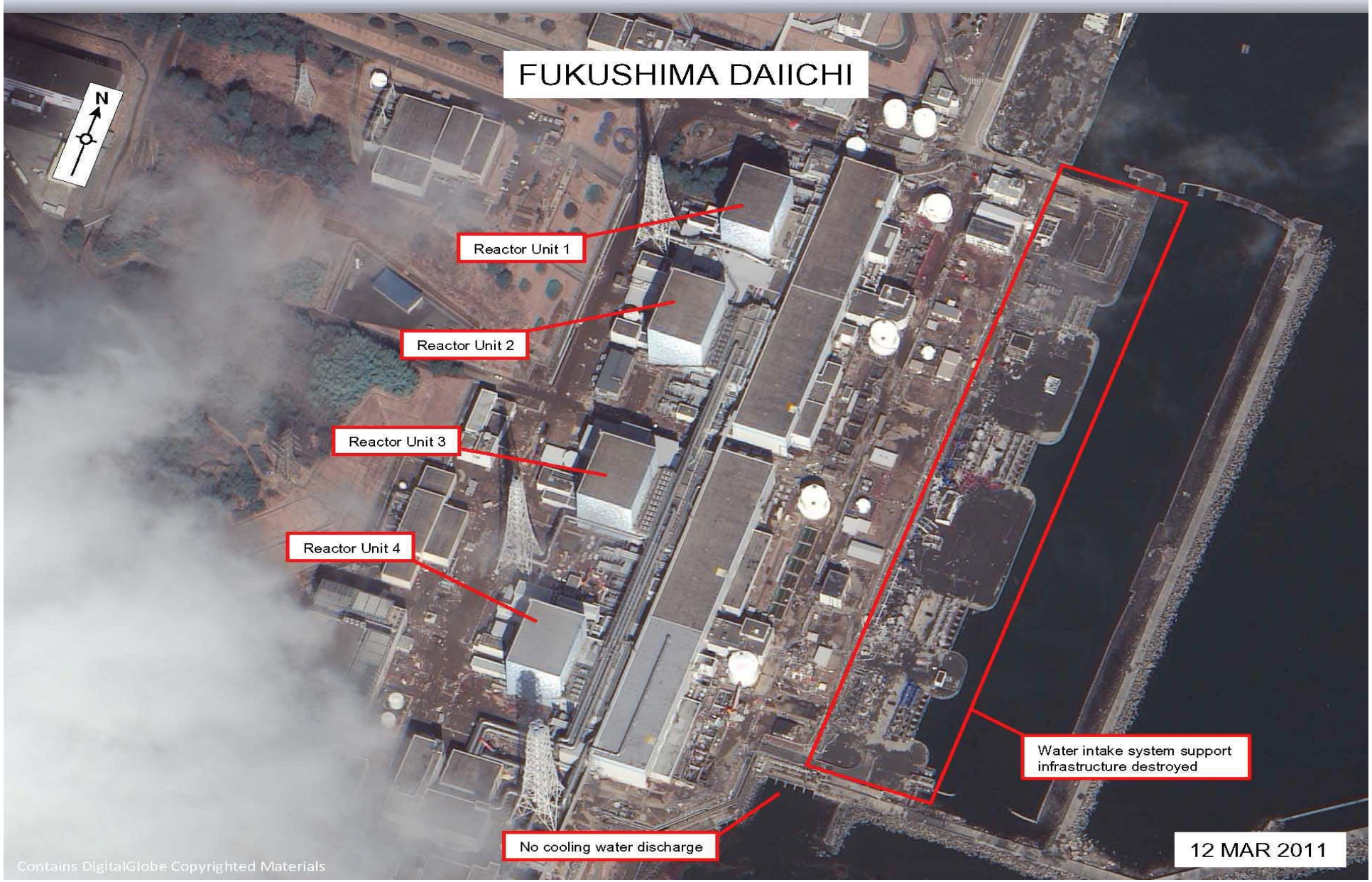
Can you confirm that it is what is declared?

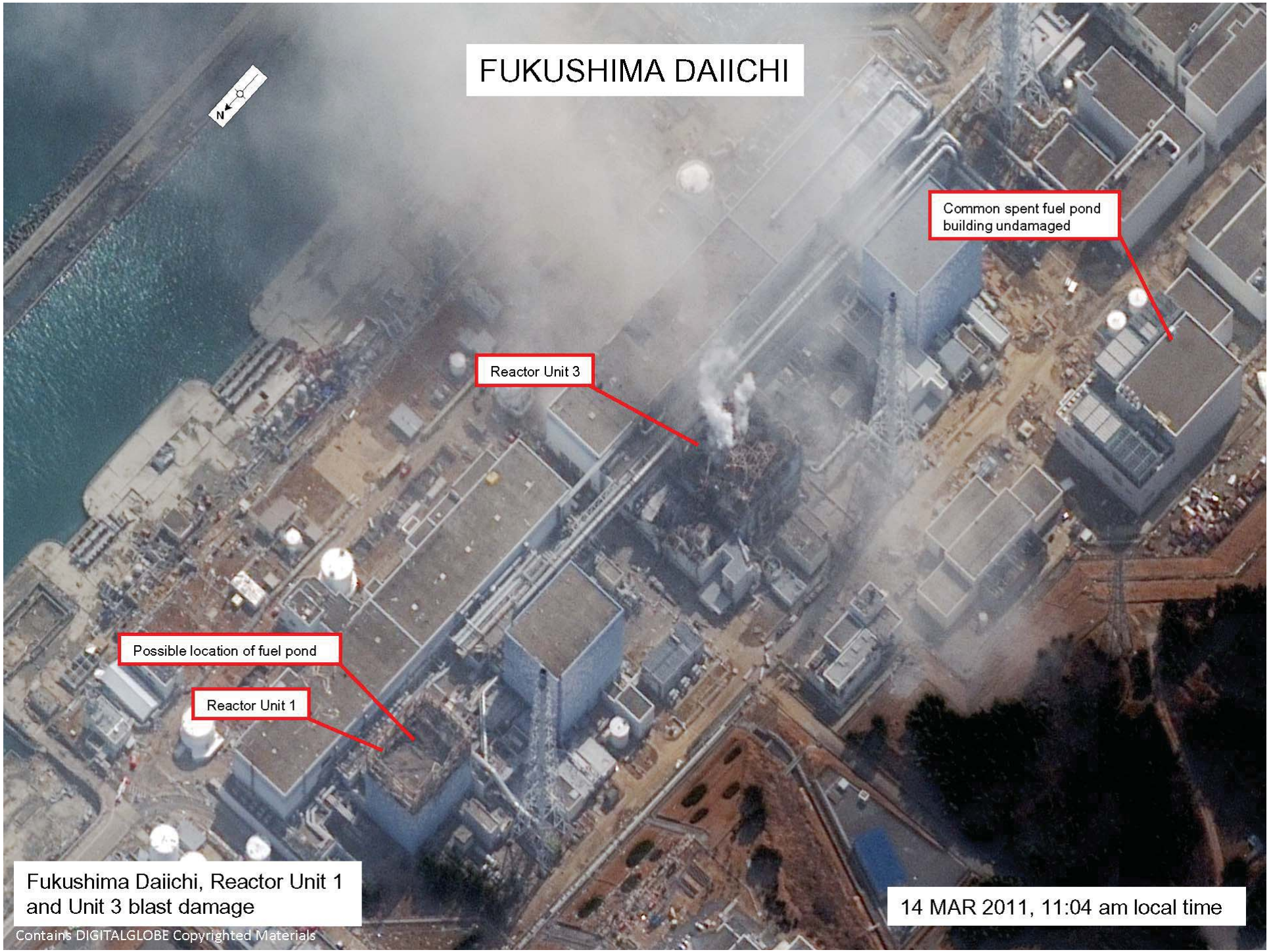
Satellite Imagery

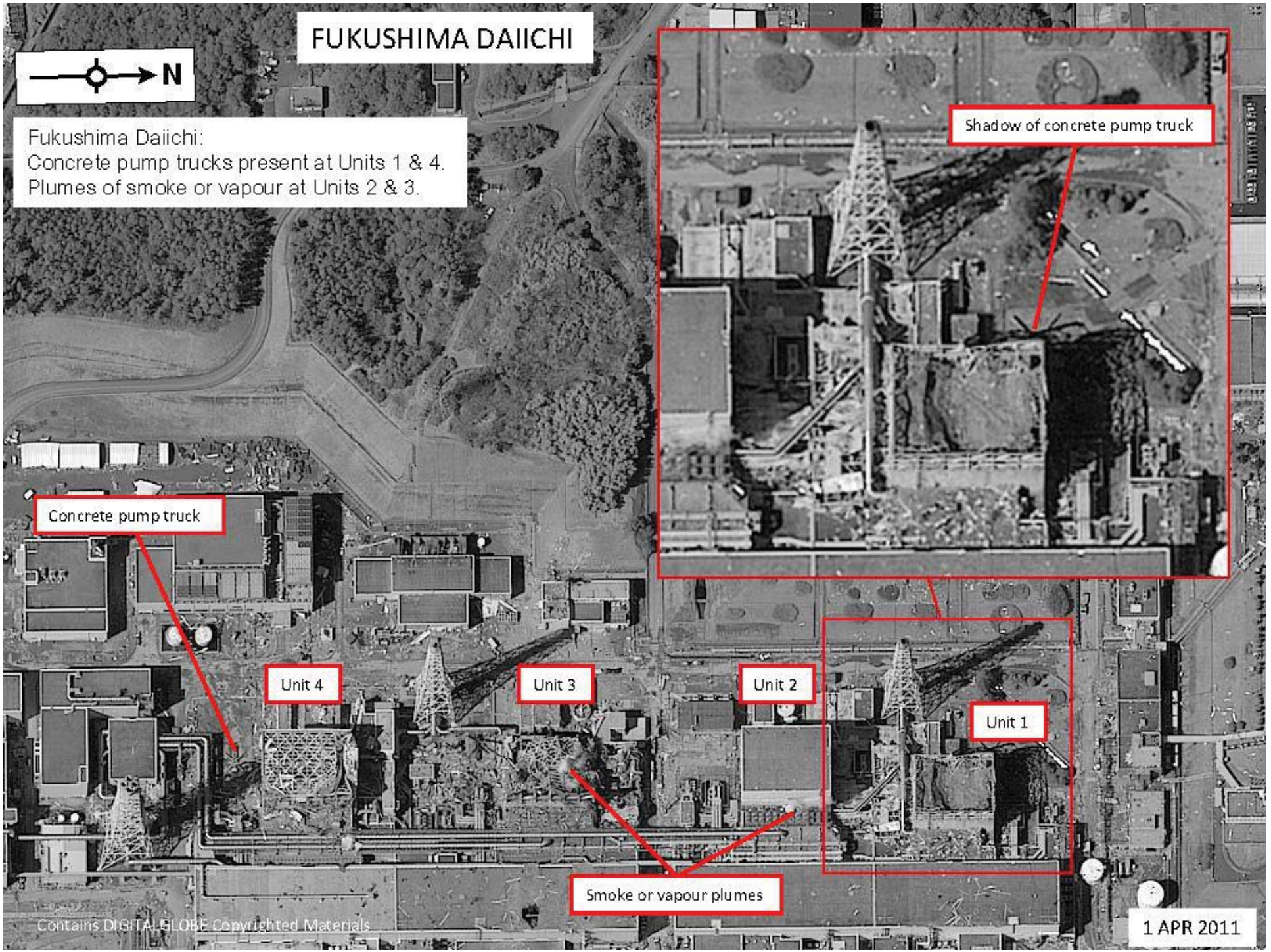
In 2011, the Agency acquired 706 commercial satellite images from 14 different Earth observation satellites over 51 countries.

- 246 new acquisitions,
- 460 purchased or received from the public archives of the Agency's commercial satellite imagery providers.

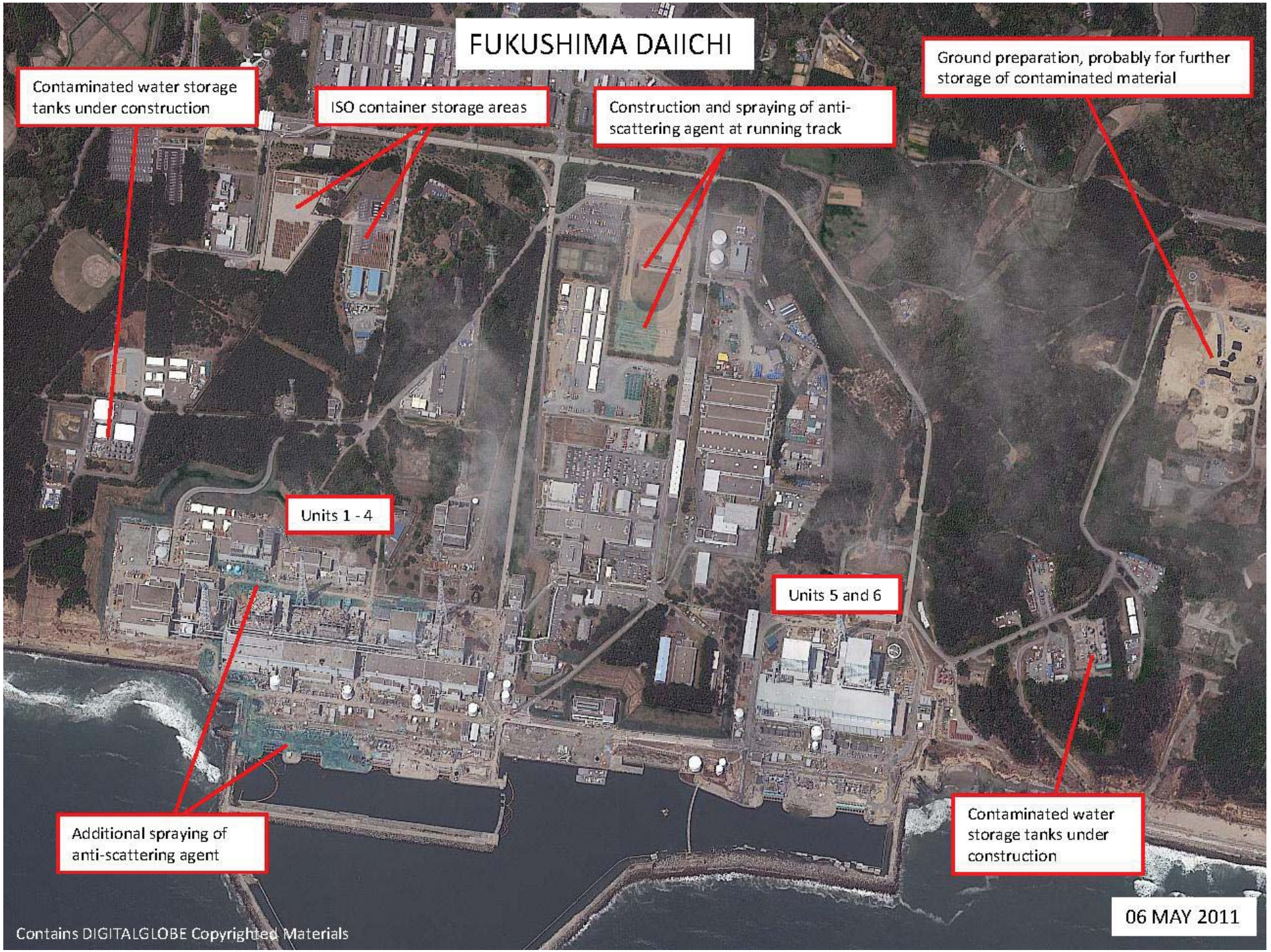
Satellite Imagery



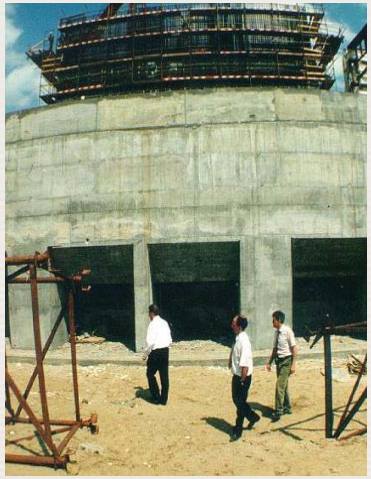

FUKUSHIMA DAIICHI
N
Common spent fuel pond building undamaged
Reactor Unit 3
Possible location of fuel pond
Reactor Unit 1
Fukushima Daiichi, Reactor Unit 1 and Unit 3 blast damage
14 MAR 2011, 11:04 am local time
Contains DIGITALGLOBE Copyrighted Materials


FUKUSHIMA DAIICHI
N
Fukushima Daiichi:
Concrete pump trucks present at Units 1 & 4.
Plumes of smoke or vapour at Units 2 & 3.
Shadow of concrete pump truck
Concrete pump truck
Unit 4
Unit 3
Unit 2
Unit 1
Smoke or vapour plumes
Contains DIGITAL GLOBE Copyrighted Materials
1 APR 2011


Fukushima Daiichi:
Two barges docked at port area, adjacent to a temporary fresh water storage tank. Fire pump trucks and hoses present for distribution of fresh water.
FUKUSHIMA DAIICHI
N
Fire pump trucks
Temporary fresh water storage tank
Unit 1
Barges
Fire hoses
Temporary fresh water storage tanks
Contains DIGITALGLOBE Copyrighted Materials
3 APR 2011


FUKUSHIMA DAIICHI
Contaminated water storage tanks under construction
ISO container storage areas
Construction and spraying of anti-scattering agent at running track
Ground preparation, probably for further storage of contaminated material
Units 1 - 4
Units 5 and 6
Additional spraying of anti-scattering agent
Contaminated water storage tanks under construction
06 MAY 2011
Contains DIGITALGLOBE Copyrighted Materials

Various Safeguards Measures (in-field & at HQ)



Design Information

Nuclear Material Accountancy

Satellite imagery

News reports

ICVD

NDA equipment

Environmental samples

COBRA seal

Metal seals evaluation

Remote monitoring data

Complementary Access

Verification Activities

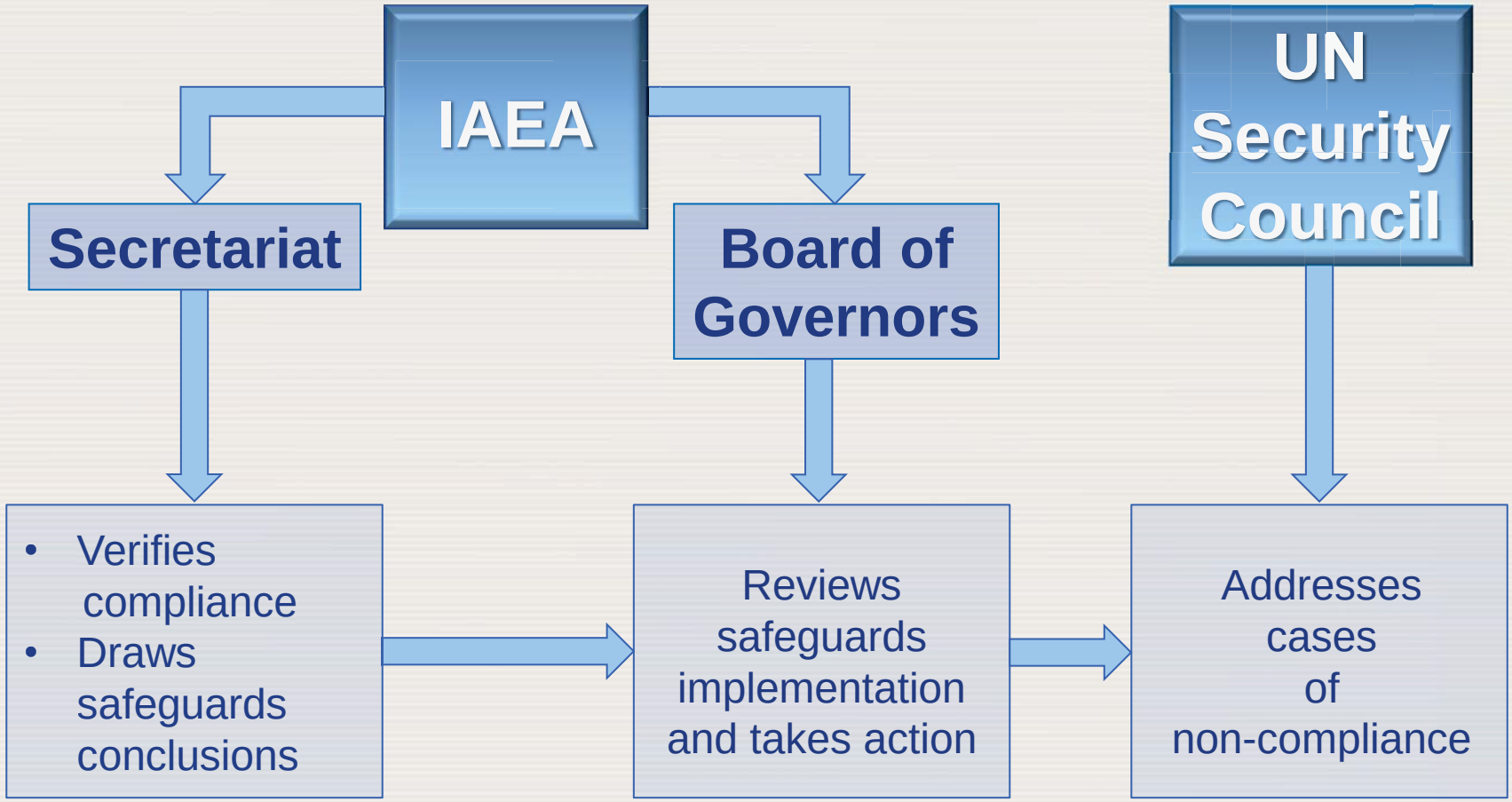
INSPECTIONS 2011 – Worldwide

Number of Facilities and LOFs under SG	1,212
Number of Facilities and LOFs inspected	558
Number of inspections	2,024
Number of nuclear material samples taken	456
Number of seals applied approx.	25,000
Number of environmental samples	409
Number of complementary accesses	109

Status of Safeguards Agreements and Additional Protocols (June 2012)

	Total	APs in force	Broader SG conclusion	Integrated safeguards
NNWSs with CSAs	171	111	58	51
NWSs with VOAs	5	5	-	-
INFCIRC/66 States	3	0	-	-
NPT States without CSAs	14	-	-	-

What are IAEA Safeguards?



Drawing Conclusions

- Drawing soundly-based conclusions on the correctness and completeness of State's declarations
- Reported to States
- Annual publication:

Safeguards Implementation Report for 2011

IAEA
Atoms for Peace

Board of Governors

GOV/2012/18 (Corrected)[1]
Date: 11 May 2012

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Item 7(b) of the provisional agenda
(GOV/2012/17)

The Safeguards Implementation Report for 2011

Report by the Director General

Summary

- The *Safeguards Implementation Report* attached hereto provides a description and analysis of the Agency's safeguards operations in 2011.

Recommended Action

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CONCLUDING REMARKS

- IAEA safeguards system is to provide credible assurances to the international community of State's compliance with its undertakings
- Cooperation with national safeguards regulatory authority is essential
- Safeguards implementation must continue to meet new challenges