IAEA | Safeguards

IAEA Safeguards for Geologic Repositories

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Purpose of IAEA Safeguards *

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- To provide credible assurance to the global community, that **all** nuclear material in a State is being used only for peaceful purposes, and thus the State is honouring its obligations under the Nuclear Non-Proliferation Treaty (NPT)

* For a non-nuclear weapon State (NNWS) under a comprehensive safeguards agreement (CSA) with the IAEA

Generic objectives of safeguards *

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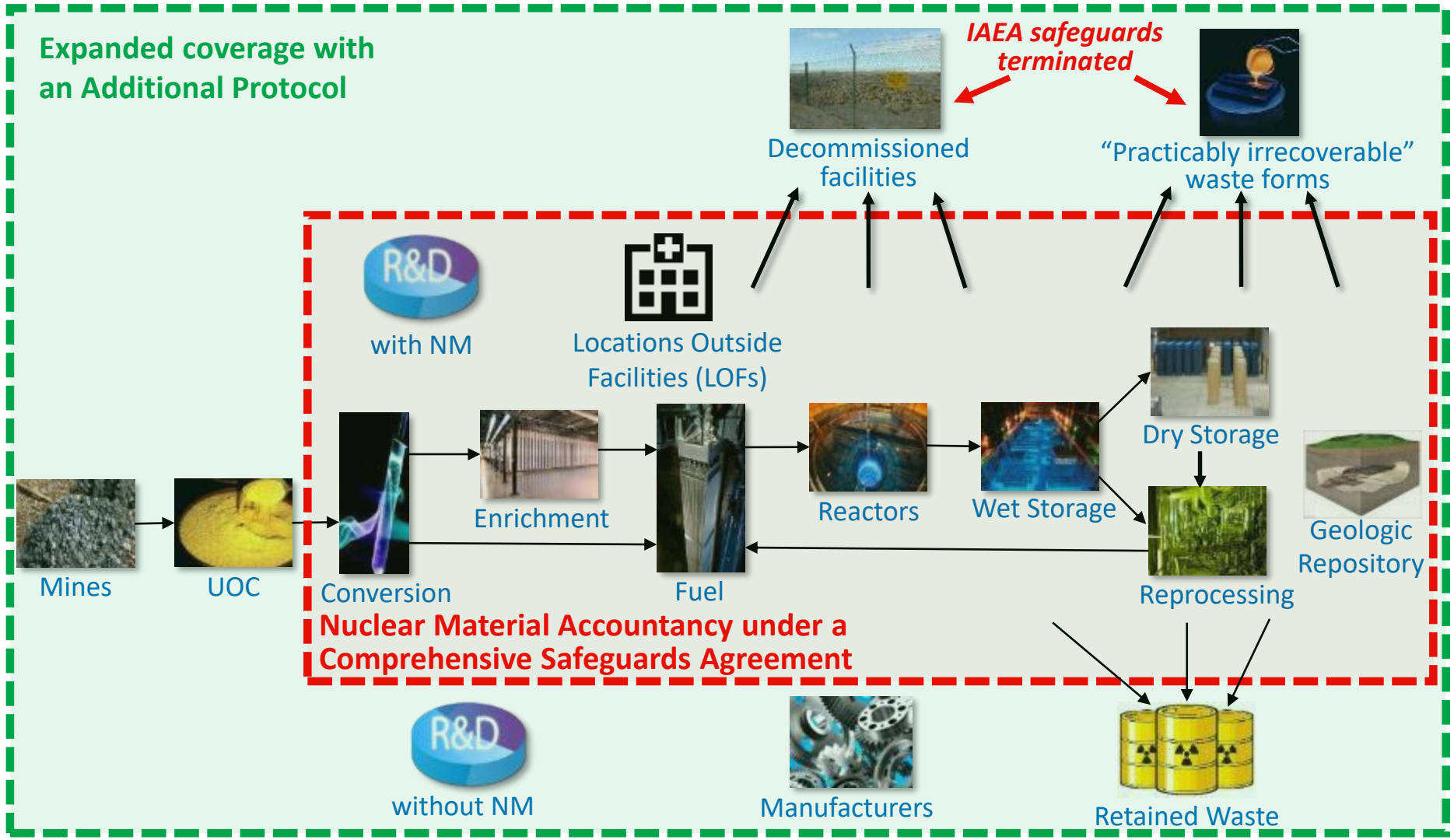
- Detect diversion of **declared** nuclear material in declared facilities or "locations outside of facilities" (LOFs)
- Detect **undeclared** production or processing of nuclear material in declared facilities or LOFs
- Detect undeclared nuclear material or activities in the **State as a whole**

(ALL THREE ARE RELEVANT TO SAFEGUARDS CONSIDERATIONS FOR GEOLOGIC REPOSITORIES)

* For a non-nuclear weapon State (NNWS) under a comprehensive safeguards agreement (CSA) with the IAEA

Safeguarding the nuclear fuel cycle *



* For a non-nuclear weapon State (NNWS) under a comprehensive safeguards agreement (CSA) with the IAEA

State-level safeguards

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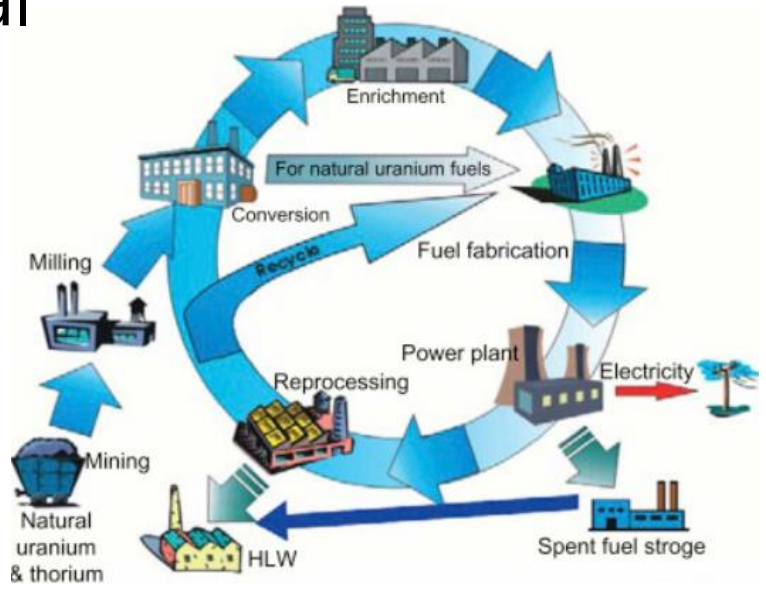
- Based on an individual State's technical capabilities, and available nuclear material
- State-wide potential "acquisition paths" (for CSA States) are analysed for the ease (timing) with which they can be used to develop weapons-usable nuclear material
- Customized State-level safeguards approach developed for each State
- Non-discriminatory, consistent methodology applied to all States



Safeguards challenges for geologic repositories

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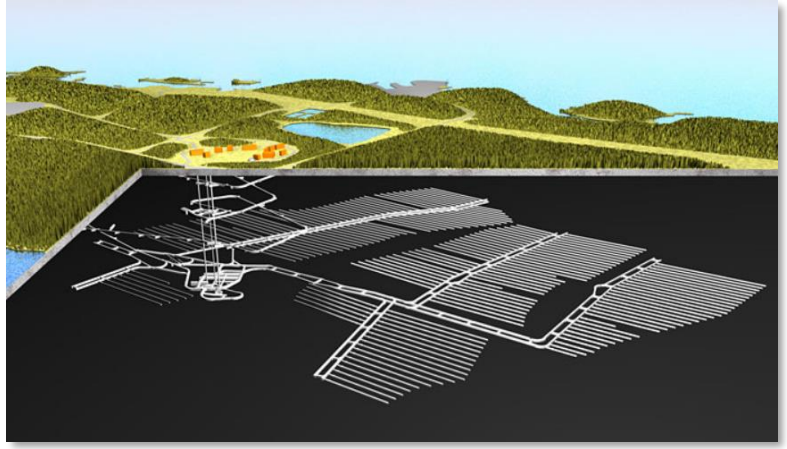
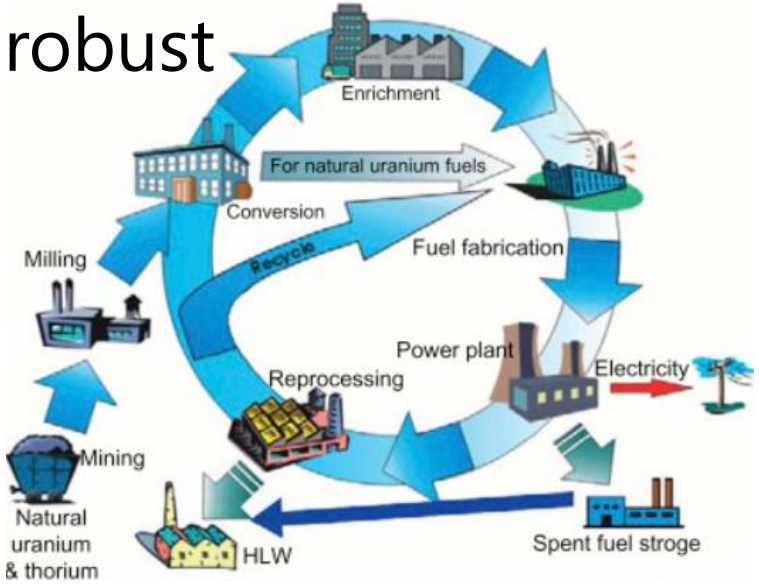
- Number of geologic repositories that are planned, under design, or under construction
- Quantity of nuclear material, and size of “containment”
- Spent nuclear fuel contains plutonium and needs to be safeguarded even after move to geological repositories
- Underground conditions harsh for both inspectors and instrumentation
- Re-verification of spent fuel practically impossible



Applying State-level safeguards to geologic repositories

- "Case by case" basis, depending on host State's capabilities
- Timescale of repository will exceed that of the nuclear fuel cycle itself, as well as institutions and other State-specific factors
- Safeguards measures need to be adaptable, robust
- **"Safeguards by design"** will be key (early discussion of safeguards requirements during design process)
- Non-invasive containment monitoring technologies needed



Safeguards measures for geologic repositories (1/2)

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- "Continuity of knowledge" of spent fuel must be maintained from last verification, to emplacement in repository
- Spent fuel in repository will be classified as "difficult to access" by Agency, requiring: (1) additional requirements for verification before emplacement, (2) reduced requirements for re-verification, and (3) on-going verification of containment.
- Safeguards measures during emplacement period: design verification, surveillance, remote monitoring, unannounced inspections, 'Additional Protocol' measures if applicable

Safeguards measures for geologic repositories (2/2)

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- Containment verification: monitoring of declared access points to underground, and verification of no undeclared access
- State-of-the-art technologies may be considered, in cooperation with State and operator (e.g. ground penetrating radar, micro-seismic monitoring)
- "State-of-the-art" will evolve during ~100 years of emplacement
- Safeguards by design essential.

The IAEA's Commitment:

IAEA Safeguards

We support the safe, secure, and peaceful use of nuclear science and technology – from cradle to grave.

$^{232}Th\ (\alpha, n)^{40}K\ ^{90}Y\ ^{16}O\ ^{235}U$