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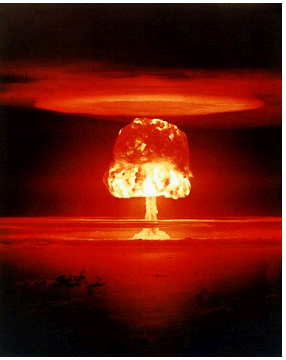
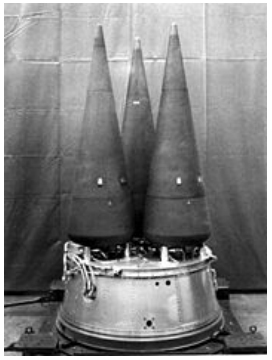

Supporting Arms Control Initiatives with Technology

The Benefits and Challenges of using Active Monitoring in Support of Verification

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Future Arms Control Agreements

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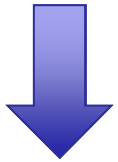
2009 Prague Speech



2010 NPR

2011 NNSA Strategic Plan

"… the United States will take concrete steps towards a world without nuclear weapons." "[New START] will set the stage for ***further cuts***…"

"Key NPR recommendations include: Address ***non-strategic*** nuclear weapons, together with ***non-deployed*** nuclear weapons of both sides, in any post-New START negotiations with Russia."

"By 2016, develop ***warhead monitoring*** and ***chain-of-custody*** capabilities for end-to-end field demonstrations in support of new arms control commitments."

Moving to Stockpile-Level Limitations

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- New START may be the last bilateral arms control agreement limited to ***strategic, deployed*** nuclear weapons
- Focus on warheads rather than delivery systems
  - Much greater numbers
  - Greater variety of facilities in warhead lifecycle
  - Much easier to hide treaty violations
- Verification under New START:
  - National technical means
  - Data exchanges and notifications
  - On-site inspections

Generating Confidence through Verification

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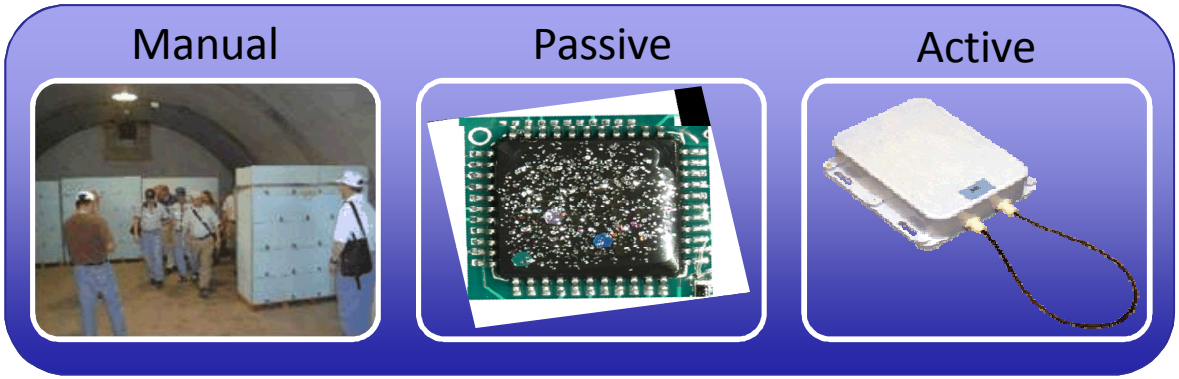
- As treaty violations become easier to hide, achieving sufficient confidence necessitates:
  - More on-site inspections with larger sample sizes of inspected equipment (increasing costs to both sides and negatively impacting host operations)

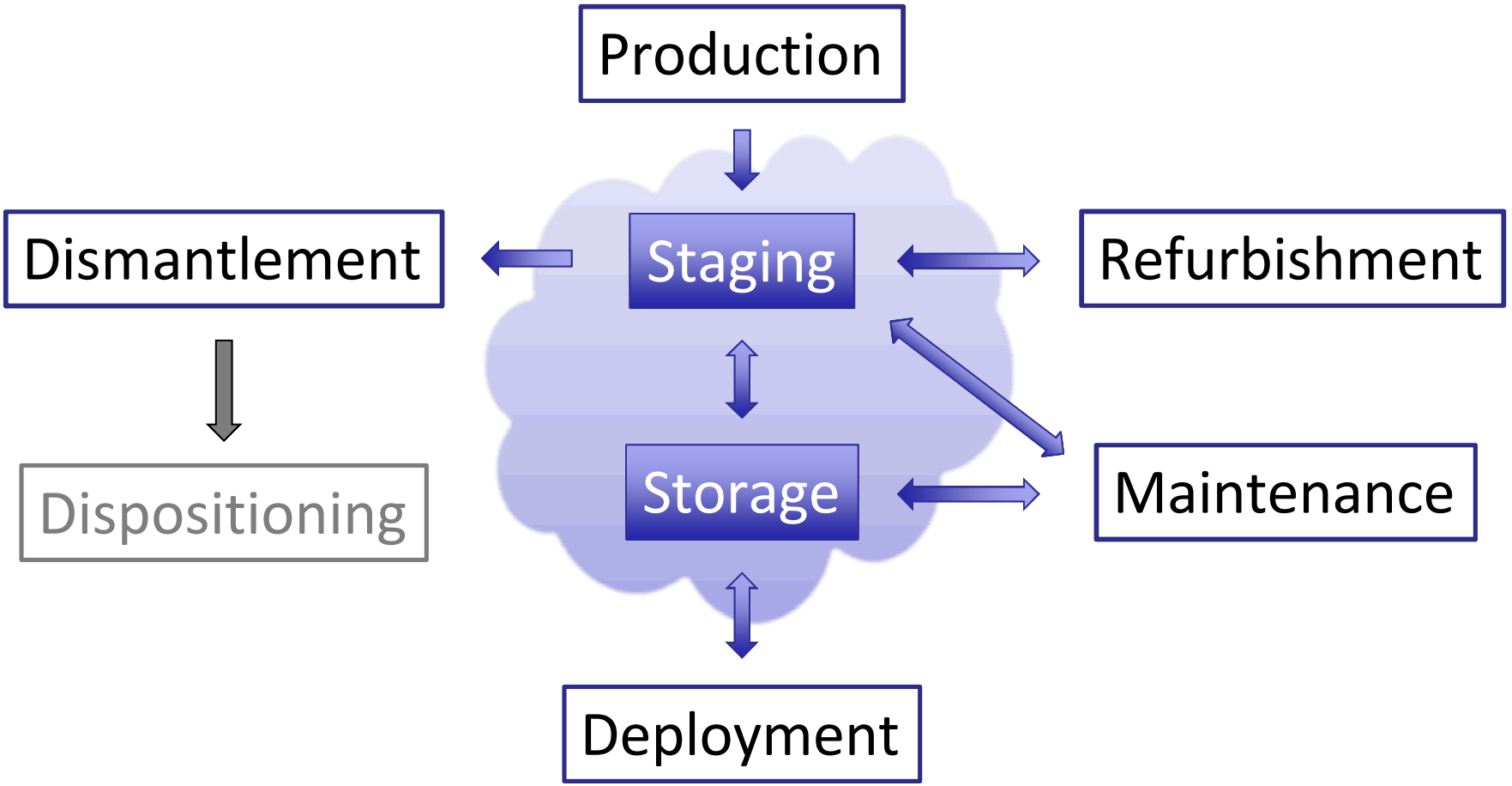
    OR
  - A monitoring system to supplement the inspections (containing costs and minimizing negative impacts to the host)

- Maintaining **continuity of knowledge** of warheads requires a more intrusive verification regime than delivery vehicles

Verification Modes:

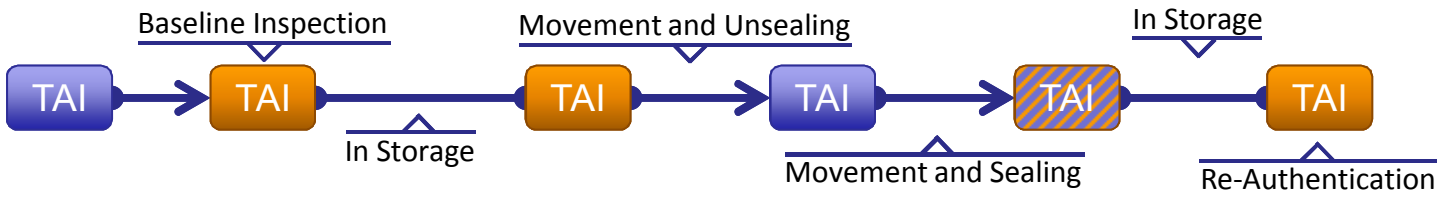


Warhead Lifecycle

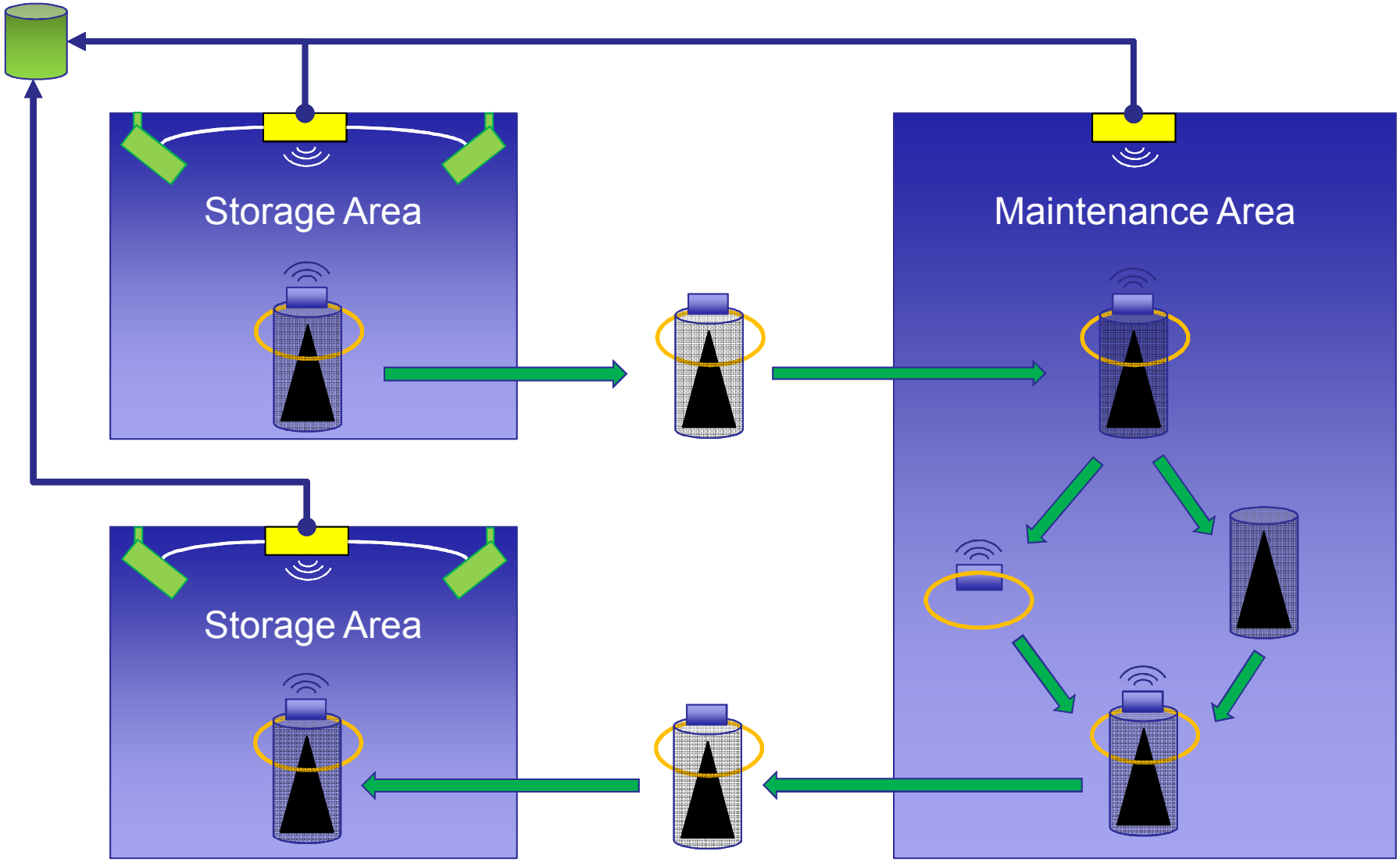


Chain of Custody Concept

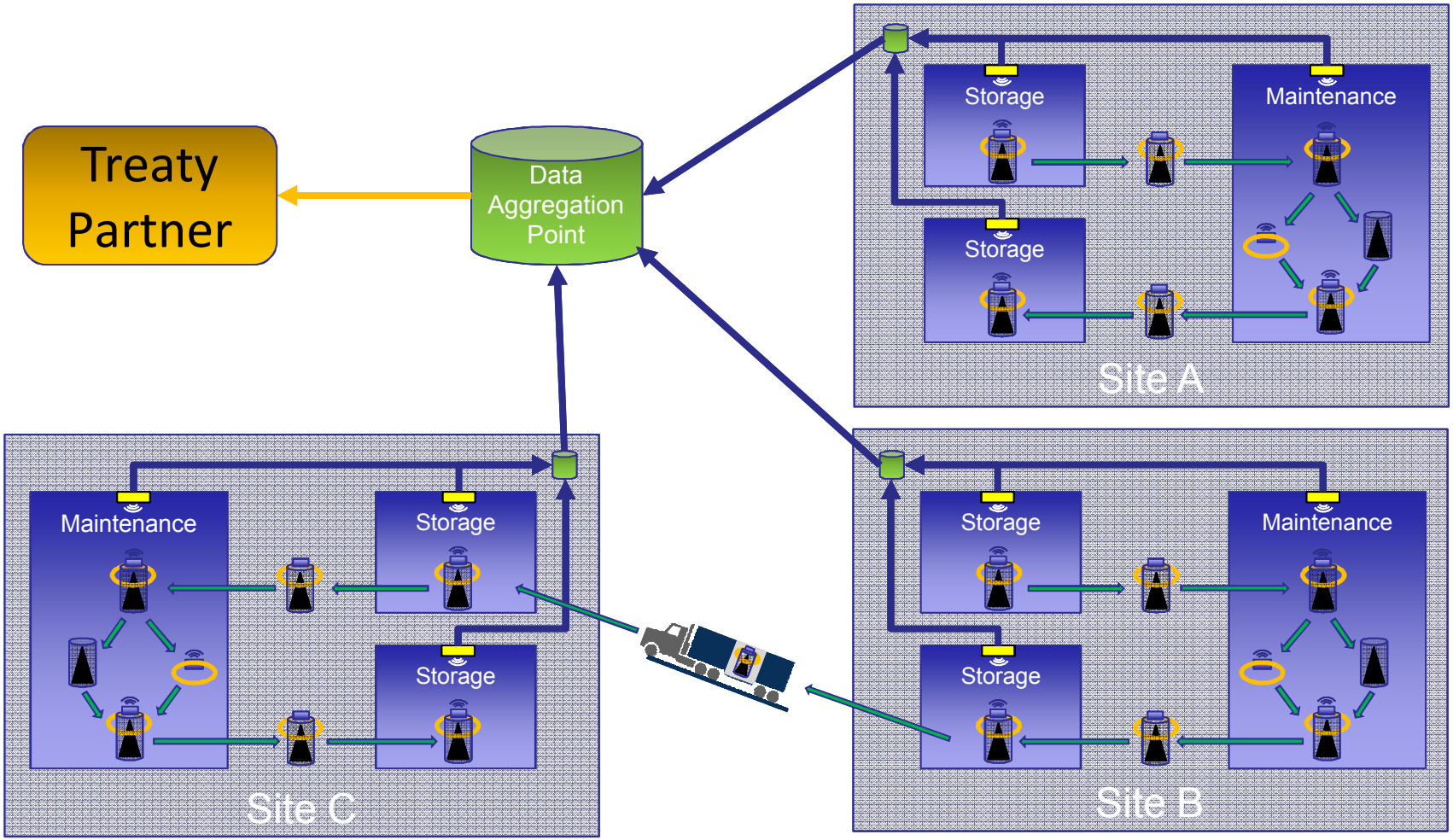
- Concept:
  - Identify all treaty-accountable items,
  - establish confidence in their identity (agreed baseline), then
  - monitor them for changes in location and integrity for as long as possible.
- Declare breaks to continuity of knowledge of items
- Use an active monitoring system to increase confidence in individual items, aggregating to confidence in the full scope of the treaty
  - Increase confidence in items and monitoring system with periodic on-site inspections using statistical sampling



Site View



National View



Active Monitoring System Characteristics

- An active monitoring system would:
  - Monitor the status of each accountable item throughout its lifecycle, where appropriate
  - Monitor the facilities where accountable items exist, where appropriate
  - Send all system generated information to aggregation points at each site, and further to a national aggregation point
- All generated information must be **trustable**
  - Information reported must be *authenticatable*
  - System equipment must be *tamper-evident* and *inspectable*
  - Multiple layers of tags, seals, and sensors provide *"evidence in depth"*

Authentication at the source + tamper-indicating enclosure = trustable monitoring node

Challenges

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- Acceptance of technological complexity in treaty verification
- Agreeing on implementation details for a monitoring regime
- Competing objectives (but it goes both ways)
  - The inspecting party must have confidence that the system is trustworthy and agreement obligations are being fulfilled
  - The host party must have confidence that the system does not compromise the safety, security, reliability of their nuclear weapons
- Releasing potentially classified information
- Managing technology lifecycles over the entire agreement duration
- Containing system cost

Benefits

- Enablement of future arms control agreements
  - Potential to allow both/all sides to draw down with increased trust
- Increased transparency
  - Could increase strategic stability regardless of reductions
- Could encourage other parties to adopt similar monitoring regimes
  - Possibility of multilateral arms control technology development