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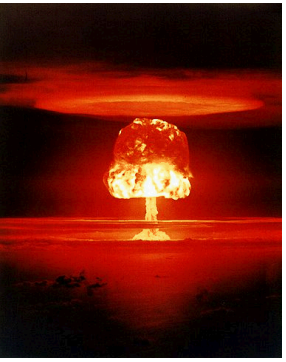
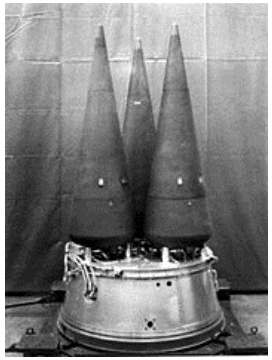

The Future of Nuclear Arms Control Verification

Generating Confidence in Warhead Accounting

Jay Brotz

November 4, 2013

Inaugural PONI U.S.-U.K. Bilateral Conference

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U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration

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Future Arms Control Agreements

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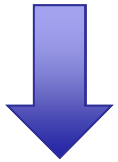
2009 Prague Speech



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 Whole-Stockpile Limitations

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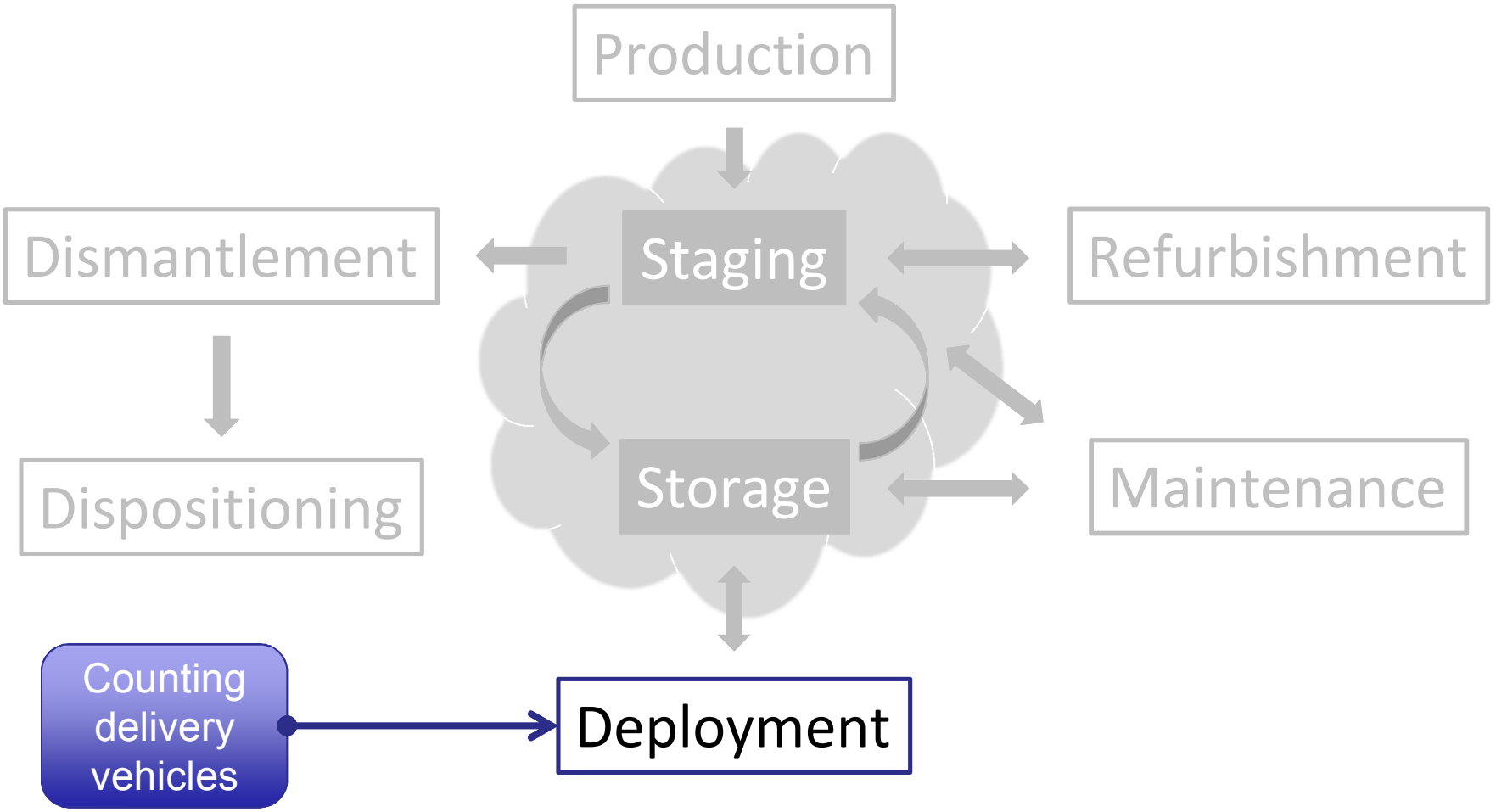
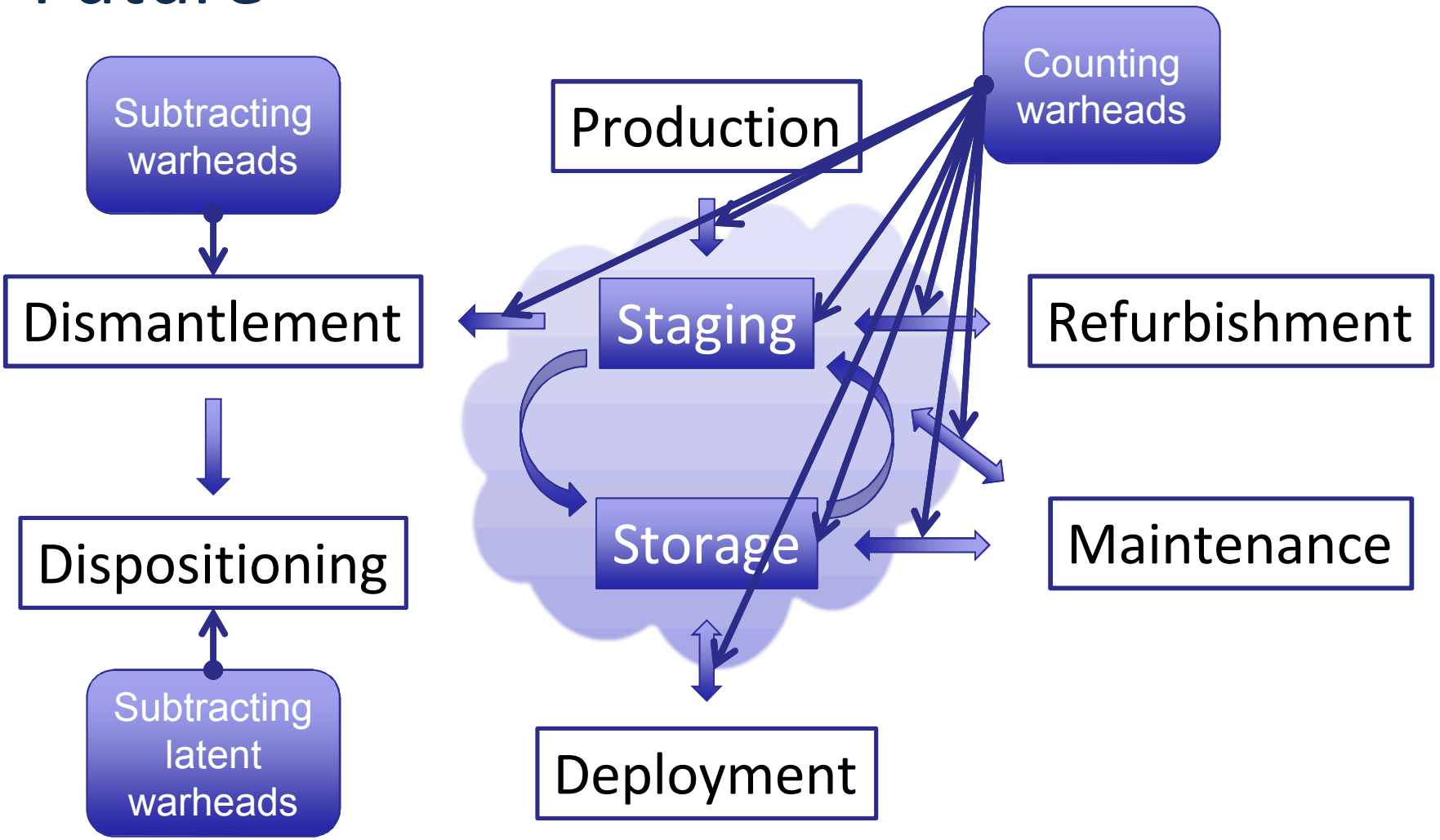
- New START may be the last bilateral arms control agreement limited to ***strategic, deployed*** nuclear weapons
- Focus on warheads rather than delivery systems
  - Much greater numbers
  - Greater variety of facilities in warhead lifecycle
  - Much easier to hide treaty violations
- Verification under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

Monitoring the Warhead Lifecycle: New START



Monitoring the Warhead Lifecycle: Future



Monitoring and Verification System

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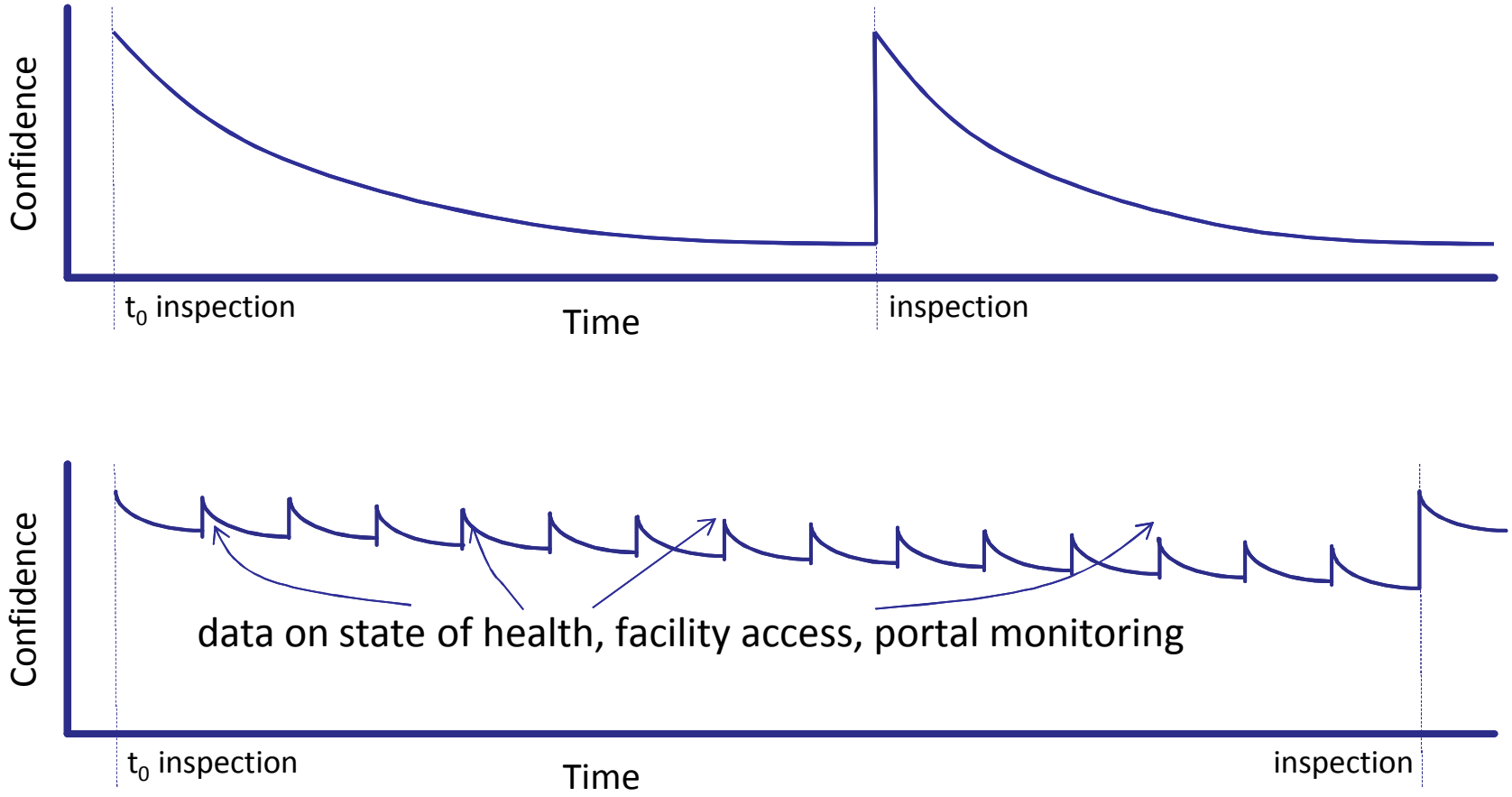
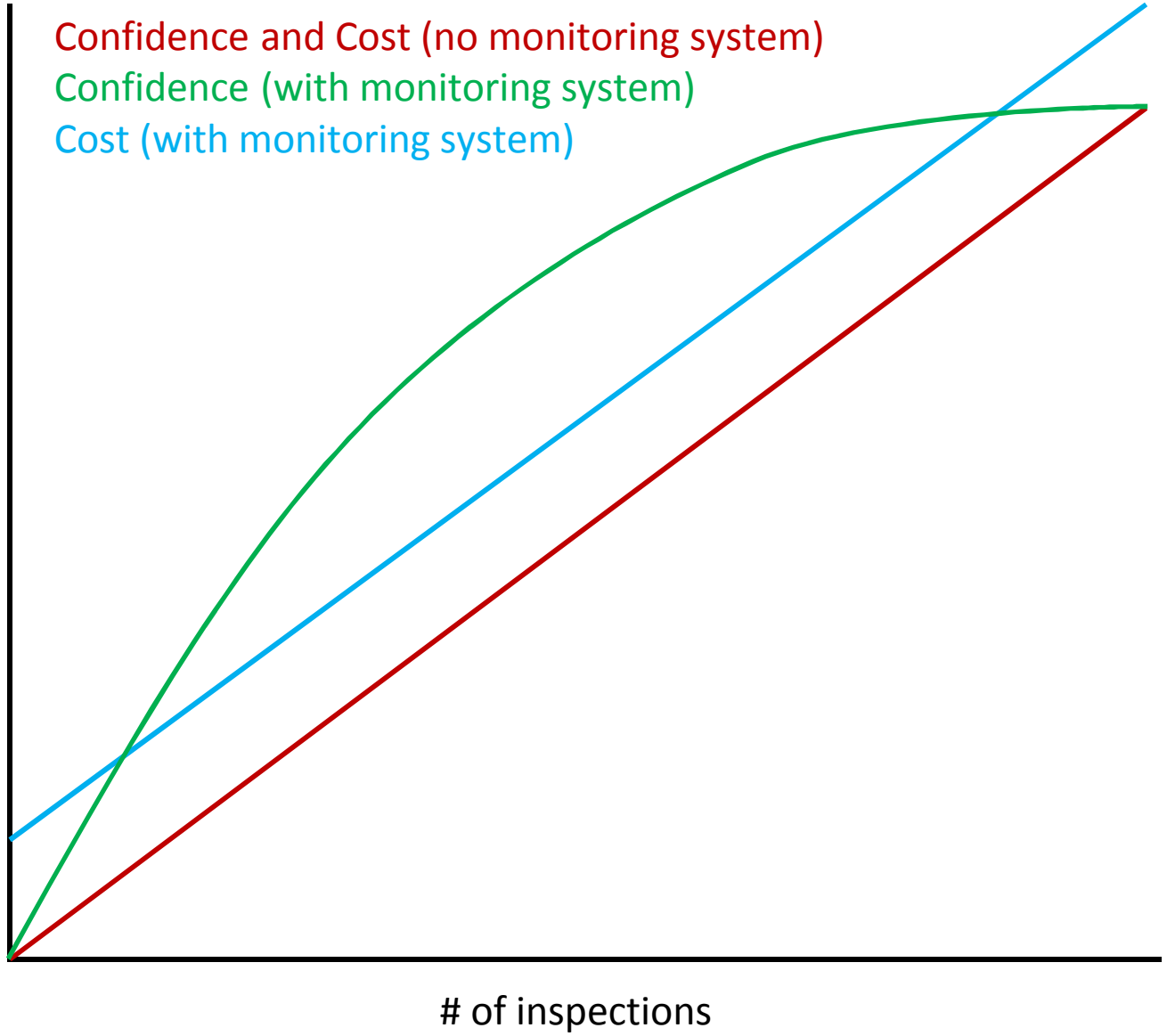
- A cooperative monitoring and verification system can:
  - Generate confidence that declared items are real weapons
  - Generate confidence that weapons have not been diverted or substituted
  - Generate confidence that declared dismantlements really are separating a real weapon into it's constituent parts
  - Generate confidence that declared dismantled parts are dispositioned (making them difficult to reconstitute into a weapon)

- A cooperative monitoring and verification system can NOT:
  - Detect undeclared weapons and undeclared locations
  - Detect undeclared production of weapons or weapon components

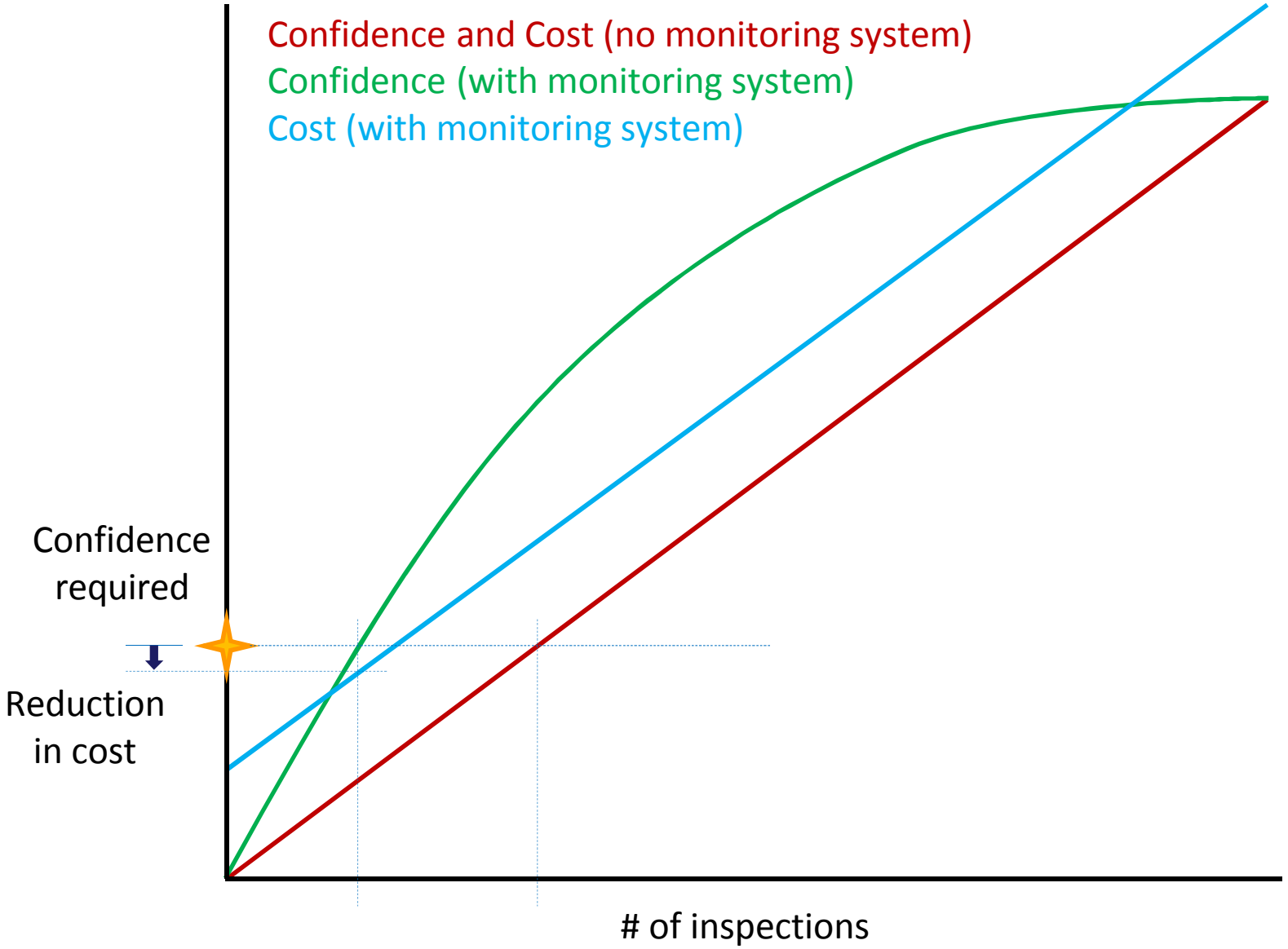
Confidence over Time



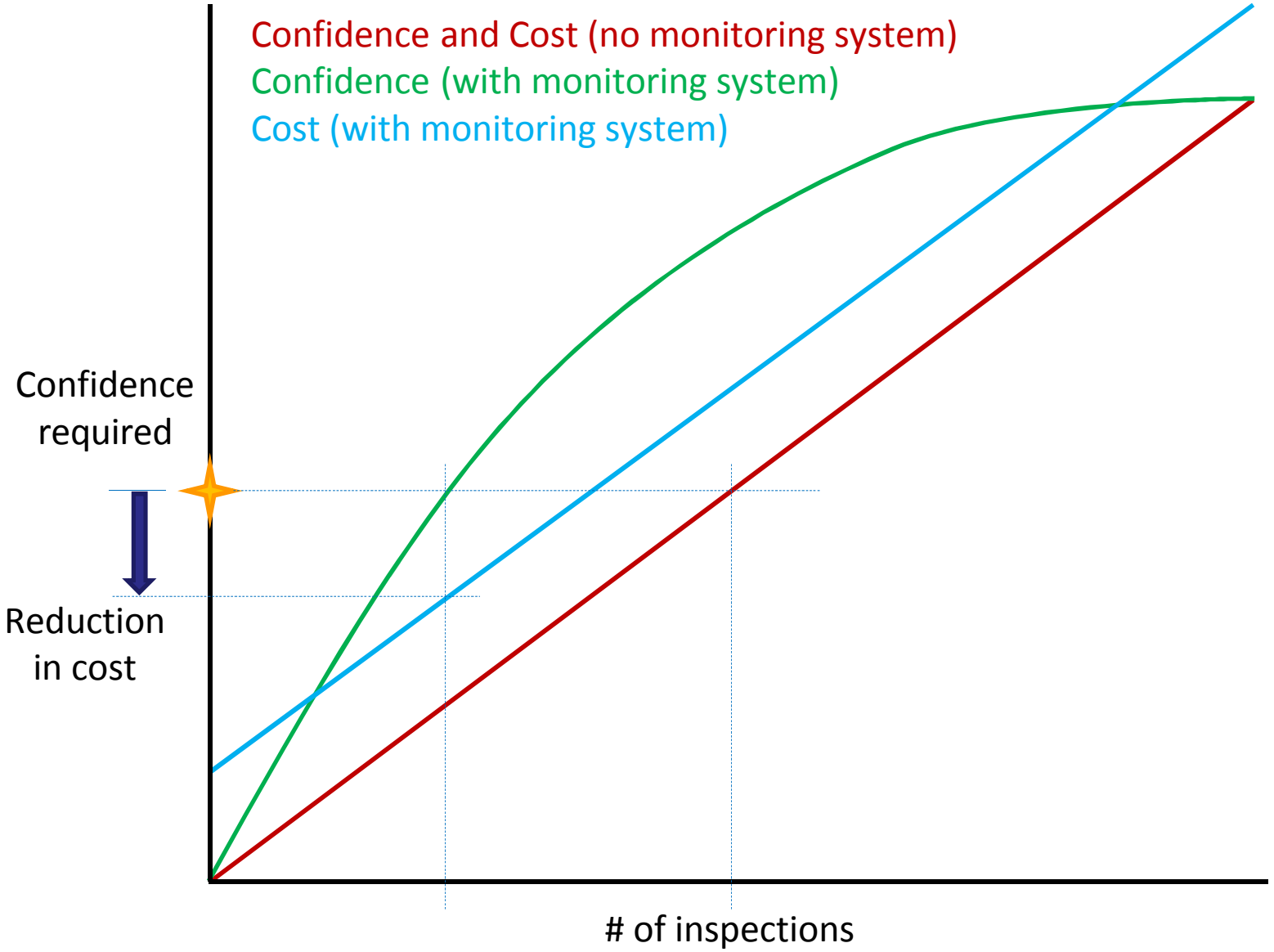
Confidence Hypothesis



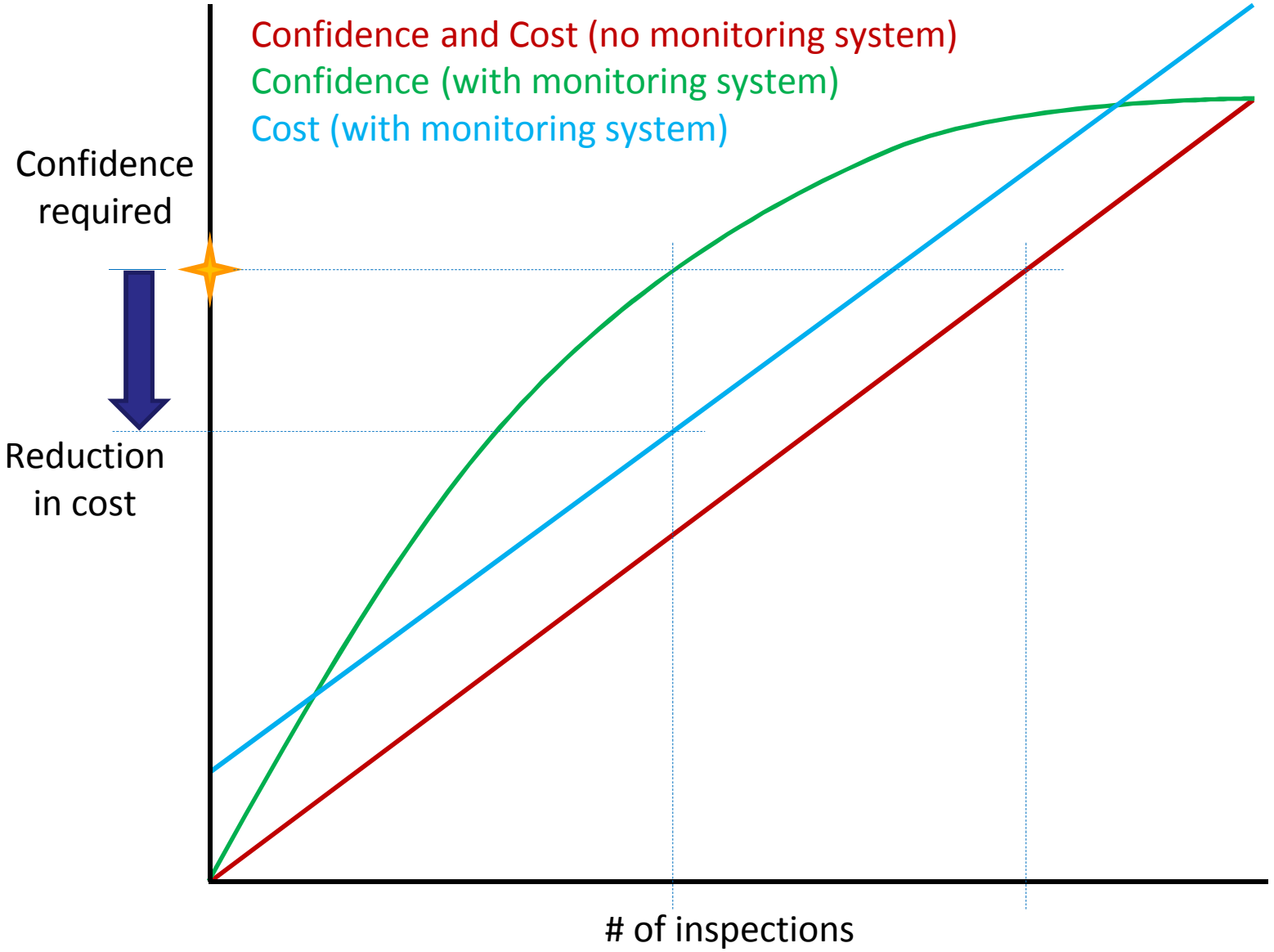
Confidence vs. Cost



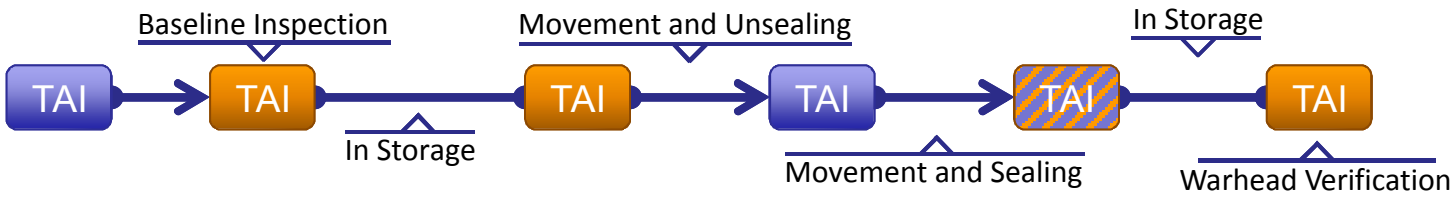
Confidence vs. Cost



Confidence vs. Cost



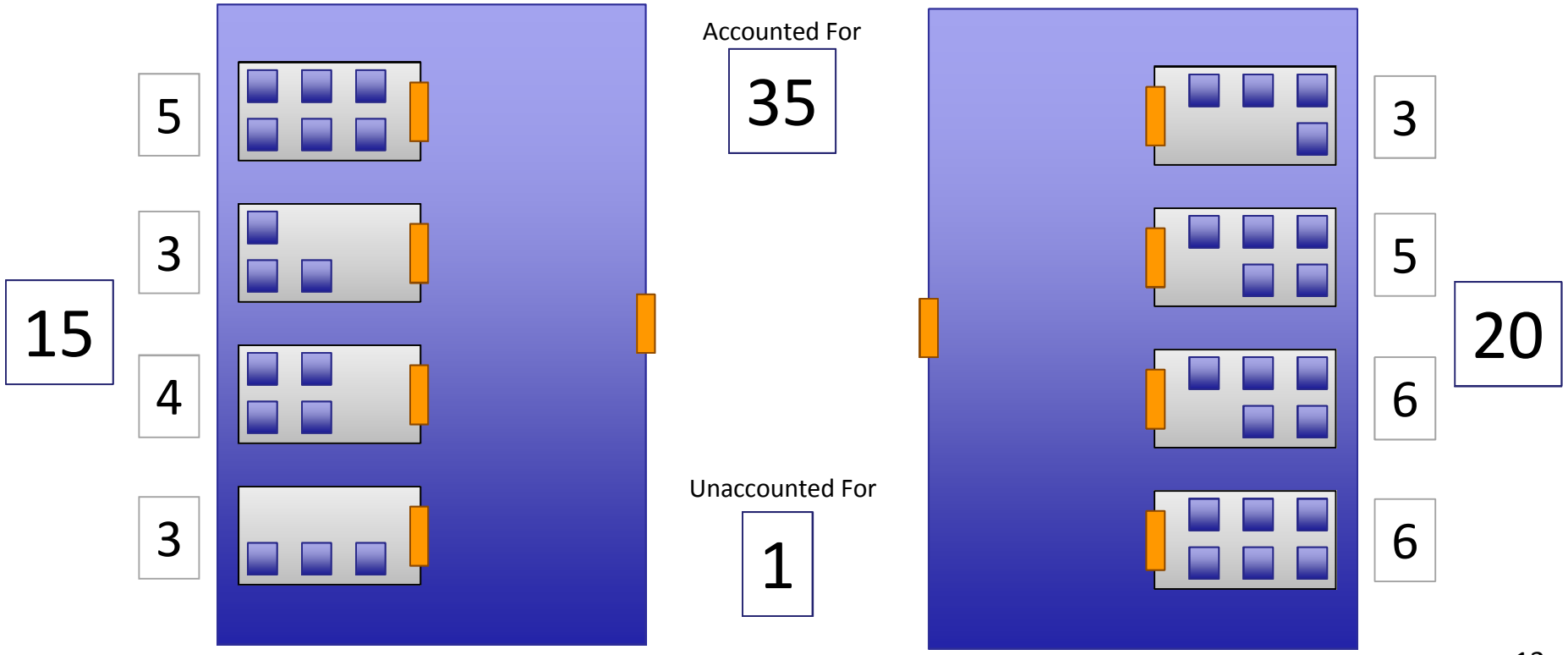
Item Accountability: Continuity of Knowledge



- 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
- Increase confidence in items and monitoring system with periodic on-site inspections using statistical sampling

Aggregate Accountability

- Alternate method to item accountability: do I have confidence in the total stockpile?
- Relies heavily on portal and perimeter monitoring



Conclusion

- We are preparing now for the need to account for individual warheads in all lifecycle stages
- Monitoring and verification systems could provide necessary levels of confidence at less cost than inspections alone
- The quantification of confidence is something that should be studied

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Questions?

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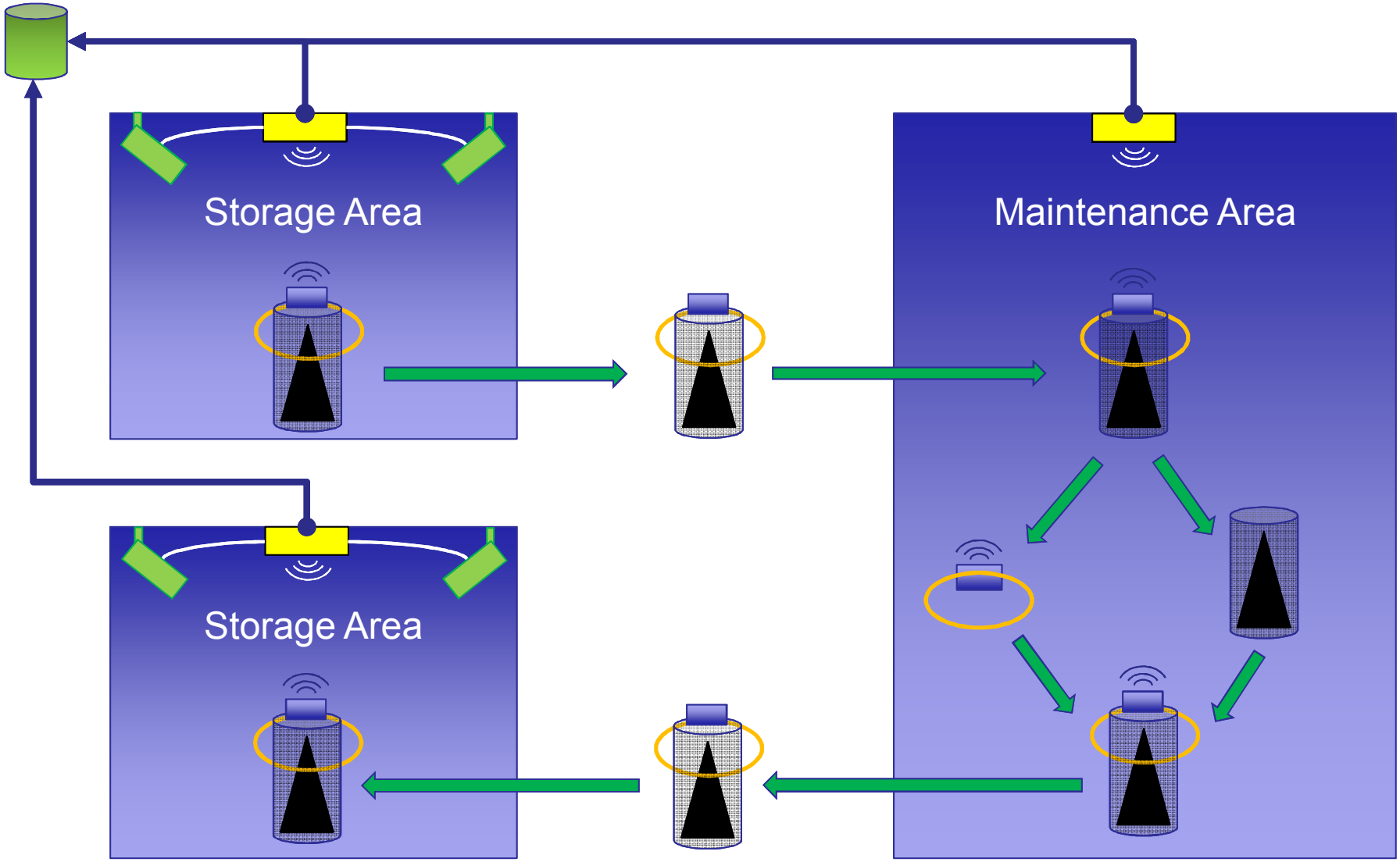
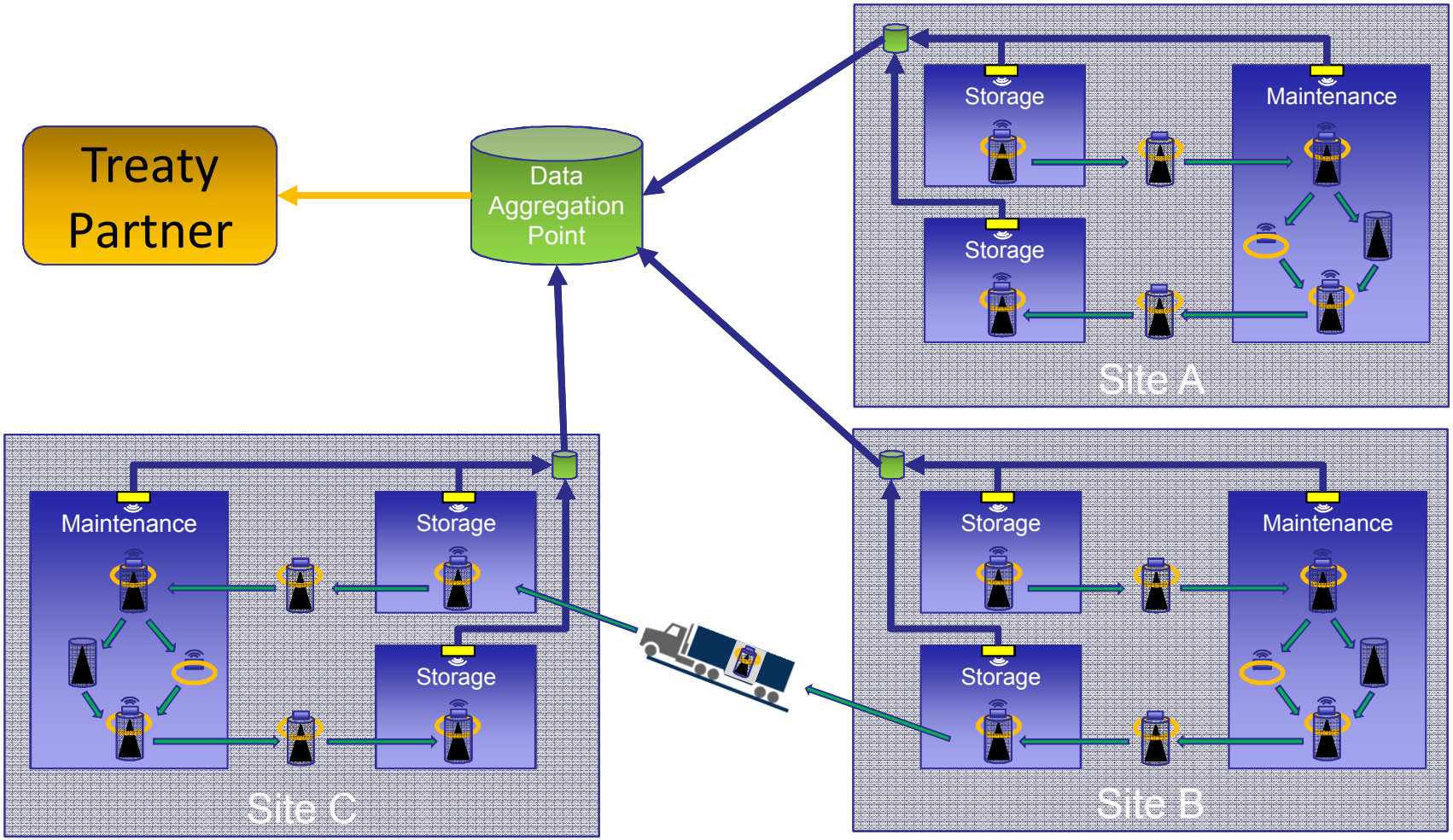
Backup slides

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