Low Number Verification Challenges

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President Obama seeks to reduce and ultimately eliminate nuclear weapons

- This goal sets up a framework for discussion of technical verification challenges at low numbers
- There are verification challenges associated with each order of magnitude reduction
  - 1,000 weapons
  - 100s of weapons
  - 10s of weapons

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Verification of 1,000 weapons may be straightforward

- Bilateral cooperation between U.S. and Russia only
- New START provides example framework
  - On-site inspections
  - National technical means
- Challenges
  - Monitoring non-deployed and non-strategic weapons
  - What do you count?
    - Level of intrusiveness for warhead verification will be greater

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Significant challenges arise for verifying reductions to 100s

- Emphasis on counting weapons instead of delivery systems
  - Basing strategy may remain similar
- Challenges:
  - Multilateral
  - Must verify reduction to third party
    - Beyond transparency of dismantlement
  - Chain of custody to verify weapon dismantlement
    - Significantly more difficult for weapons compared to delivery vehicles
    - Authentication: Issue of host supplied, host operated equipment
- Caveats:
  - Missile defense, conventional, and regional concerns

Multilateral verification at 100s of weapons requires a new approach

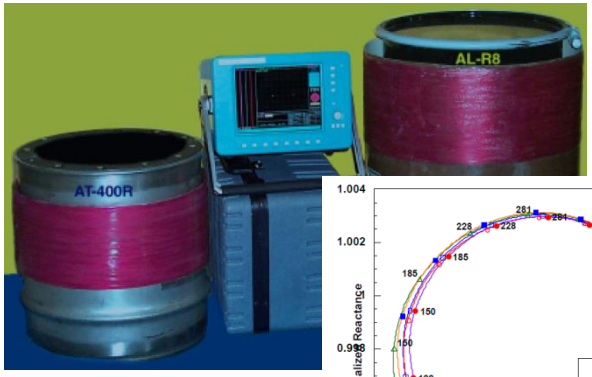
- Nuclear Archeology:
  - All fissile material production
- Establish baseline stockpile
  - Simple observation – modified Open Skies
  - Unique identification
- Non-nuclear threats to stability?
- Rethinking of deterrence and targeting?
- Begin chain of custody earlier
  - Deployment site to interim storage
- Maintain custody later
  - Dismantlement to disposition

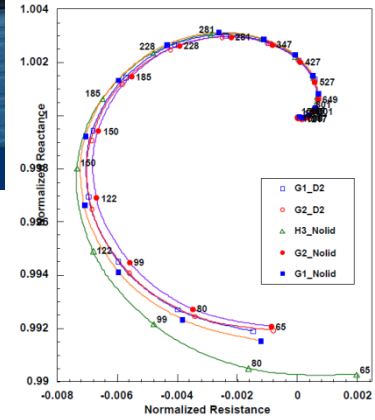
Move towards high confidence verification at 100s of weapons

- Much greater intrusiveness will be required for verification
  - Agreement to share some classified information
  - Need to prove presented item is a genuine weapon
  - Watch destruction of other weapon components
- Monitoring entire weapon lifecycle
  - Rigorous on-site inspections and national technical means (modified Open Skies)
  - Deployment, storage, and assembly/dismantlement sites
  - Transfer to other regimes for long term storage or disposition
- Detection of undeclared materials and activities

Verification technology required in all stages

- Non-Destructive Assay
  - Passive and active radiation techniques
    - Limitations with complex designs
    - Imaging, templating
  - Gamma and neutron detectors
    - Very robust spectral data
    - Without information barrier, will reveal classified
  - Complex, high tech equipment very difficult to certify (host) and authenticate (inspector)





- Non-Destructive Evaluation
  - EM coil, ultrasonics, others
- TID/TIE; Unique ID
  - Required to secure material, items, equipment, containers.
  - Inspector equipment and all data will be solely under host control for long periods of time

Chain of custody challenges must be overcome

- Must be maintained to verify weapon dismantlement
  - End Point: Confidence that measured item at end of dismantlement came from presented weapon at the front-end of the dismantlement process

- Authentication and certification
  - Very different from safeguards
- Protection against diversion and spoofing
  - Room sweeping, cameras, portal monitors, NDA, imagers
- Maintain custody of more than just weapon
  - Treaty limited items, material, equipment, verification tools, computers
- Cannot be present during dismantlement!
  - May change at 10s of weapons

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International verification at 10s of weapons is a novel approach

- Dedicated, international dismantlement facility?
- International inspectorate?
  - Will have to prove to international community
- Will require a robust global material control regime
- Inter-play between adversarial countries
- Survivability of remaining stockpile
  - Maintain stability, address imbalances
    - Nuclear and conventional
  - Strong international enforcement regime
- Irreversibility of dismantlement
  - Agreed to disposition pathways

Conclusions

- At each order of magnitude reduction of weapons, there are significant challenges that must be overcome
  - Verification technology
  - Multilateral scenarios
- Destabilizing issues
  - Deterrence questions
  - Survivability
  - Non-nuclear capabilities
  - Technical disparity between parties