

Challenges for Effective and Efficient Denuclearization

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Comparison of Denuclearization

	South Africa	Libya	DPRK
Nuclear Weapon, type	6-7 HEU	No Nuclear weapon HEU	20-60 HEU, Pu, H bomb
Termination of program	1989	2003	2018 ?
Dismantled and removed material and equipment	Nuclear weapon, nuclear test site, weapon fabrication, HEU, uranium enrichment facilities	Uranium enrichment components, nuclear material	Nuclear weapon, nuclear test sites, weapon fabrication, HEU and Pu, uranium enrichment facilities, reprocessing, graphite reactor
Dismantlement by	State, limited IAEA engagement	Other states, limited IAEA engagement	
Period of dismantlement	1990-1993 (3 years)	2004-2006 (2 years)	
NPT, CSA, Additional Protocol (AP)	NPT 1991 CSA 1991 AP 2002	NPT 1975 CSA 1980 AP 2006	NPT 1985 CSA 1992 2003 withdraw NPT
Verification	All nuclear material, facilities, weapon program	All nuclear material, facilities, undeclared activities	
Period of verification	1991-1995 (4 years)	2003-2008 (5 years)	

Dismantlement Case Study

Options	Features	Resource and time	Comments
Dismantlement (South Africa)	<ul style="list-style-type: none"> • Eliminate capabilities • Eliminate sensitive technologies • Difficult to reuse material • Easy to verify 	<ul style="list-style-type: none"> • Large resources for dismantlement • 3-10years 	<ul style="list-style-type: none"> • Resource vary by level of contamination of facilities and safety standard applied
Disablement	<ul style="list-style-type: none"> • Eliminate capabilities • Sensitive technologies remain • Material reusable • Verification and monitoring required 	<ul style="list-style-type: none"> • Small resources for disablement • 3 month -1year 	<ul style="list-style-type: none"> • Nuclear fuel cycle knowledge requires for effective disablement
Removal, transfer to third State (Libya)	<ul style="list-style-type: none"> • Eliminate capabilities • Eliminate sensitive technologies • No reuse of material • Easy to verify, no monitoring required 	<ul style="list-style-type: none"> • Large resources for removal and transport • 3-10years 	<ul style="list-style-type: none"> • Very difficult to transfer reactor and reprocessing facilities due to high radiation
Monitoring (Iran JCPOA)	<ul style="list-style-type: none"> • Capabilities remain • Sensitive technologies remain • Material reusable • Intensive verification and monitoring required 	<ul style="list-style-type: none"> • Relatively large resource for monitoring • More than 10 years 	<ul style="list-style-type: none"> • Freeze nuclear activities, material and equipment remain

Strengths in Denuclearization Process

Denuclearization Process	Dismantlement	Verification
Dismantlement of nuclear test site	Nuclear Weapon States (NWS), South Africa	NWS, CTBTO
Disposal/removal of nuclear weapon	NWS, South Africa	NWS, IPNDV*
Dismantlement/disablement of nuclear weapon fabrication	NWS, South Africa	NWS, IAEA
Disposal/removal of weapon usable material (PU, HEU)	NWS, South Africa	NWS, IAEA
Dismantlement/disablement of facilities to produce weapon usable material (uranium enrichment, reprocessing, nuclear reactor)	Enrichment: URENCO, Russia, USA, Japan Reprocessing: France UK, Russia, Belgium, Japan	IAEA, States with facility under IAEA safeguards
Disposal/removal of nuclear material	States with nuclear facilities	IAEA, States under IAEA safeguards

*IPNDV : International Partnership for Nuclear Disarmament Verification

Effective and Efficient Denuclearization

- Use lessons learned from past denuclearization experience
- Perform case study to evaluate resources, time and effectiveness
- Role of IAEA in verification is utmost important
- Use experience from relevant countries