

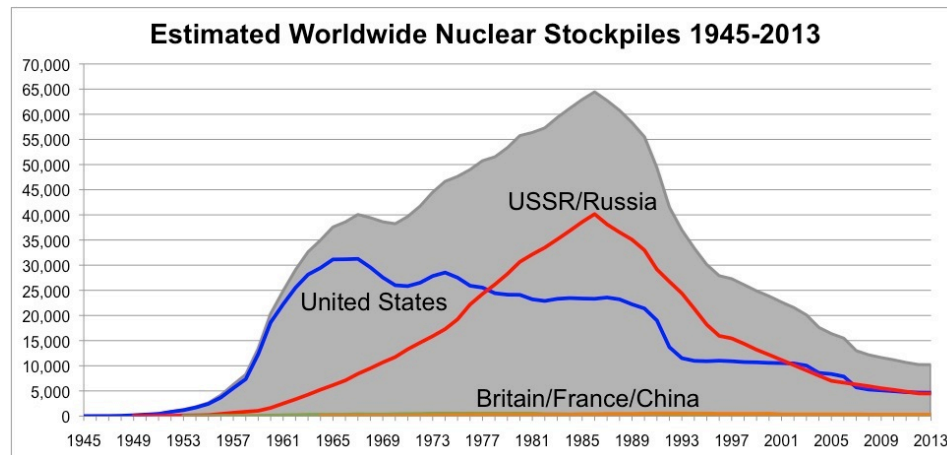
## Nuclear Weapons and Arms Control: Modernizing Nuclear Arsenals



Hans M. Kristensen  
Director, Nuclear Information Project  
Federation of American Scientists  
Phone: 202-454-4695  
Email: [hkristensen@fas.org](mailto:hkristensen@fas.org)

Presentation to  
Short Course on Nuclear Weapons issues in the 21<sup>st</sup> Century  
Elliott School of International Affairs  
George Washington University  
Washington, D.C.  
November 3, 2013

## Status of nuclear forces



Today: ~ 10,200 warheads in stockpiles (17,200 if counting retired intact warheads awaiting dismantlement)

US and Russia possess 90% of global inventory (94% if counting retired intact warheads): each has 4 times more warheads than rest of world combined; 15 times more than third-largest stockpile (France)

Decreasing: US, Russia, Britain, France

Increasing: China, Pakistan, India

Israel relatively steady; North Korea trying

More than 125,000 warheads produced since 1945

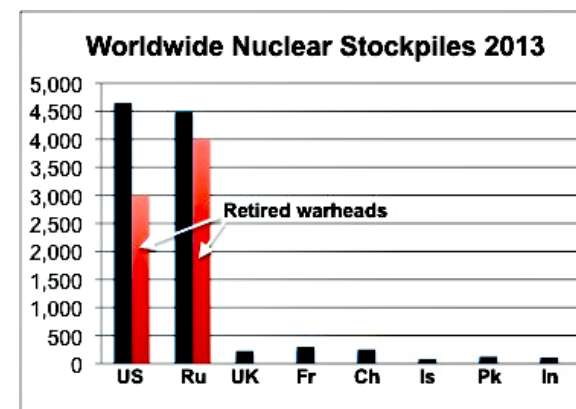
Peak of 64,500 stockpiled warheads in 1986 (70,300 if including retired)

- US stockpile peaked early (1967)
- Russian stockpile peaked late (1986)

Enormous progress since 1986 peak:

- ~54,000 warhead stockpile reduction
- ~47,000+ warheads dismantled

Trend: pace of reductions slowing



## Modernizations: United States

### ICBM

- Minuteman III life-extension fielding
- GBSD replacement ICBM planning
- W78 warhead life-extension/upgrade planning

### SSBN / SLBM

- Ohio SSBN life-extension fielding
- Trident II SLBM life-extension planning
- SSBN(X) planning (12)
- W76-1 warhead life-extension fielding
- W88 warhead life-extension planning

### Bombers

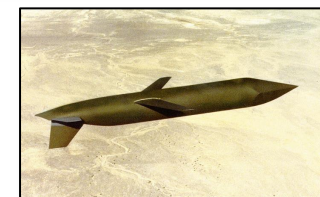
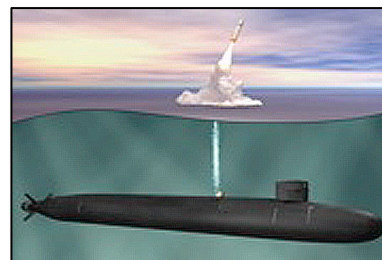
- B-2 upgrade planning
- B-52 upgrade planning
- LRS-B next-generation bomber planning
- B61 bomb life-extension/upgrade planning
- LRSO (ALCM) replacement planning

### Tactical

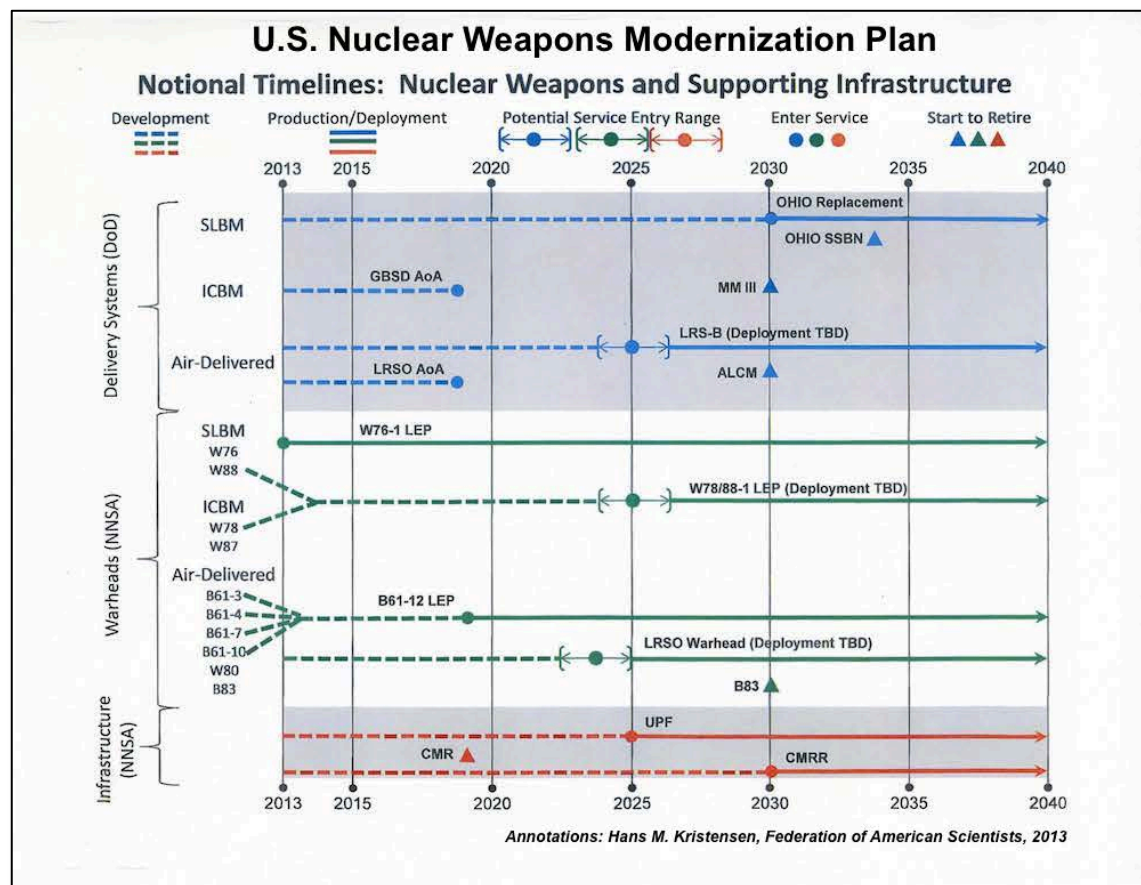
- F-35 nuclear capability planning
- B61 life-extension/upgrade planning

### Infrastructure

- Uranium Processing Facility (secondaries) planning
- Plutonium production facility (primaries) planning
- National Ignition Facility planning



## Modernizations: United States



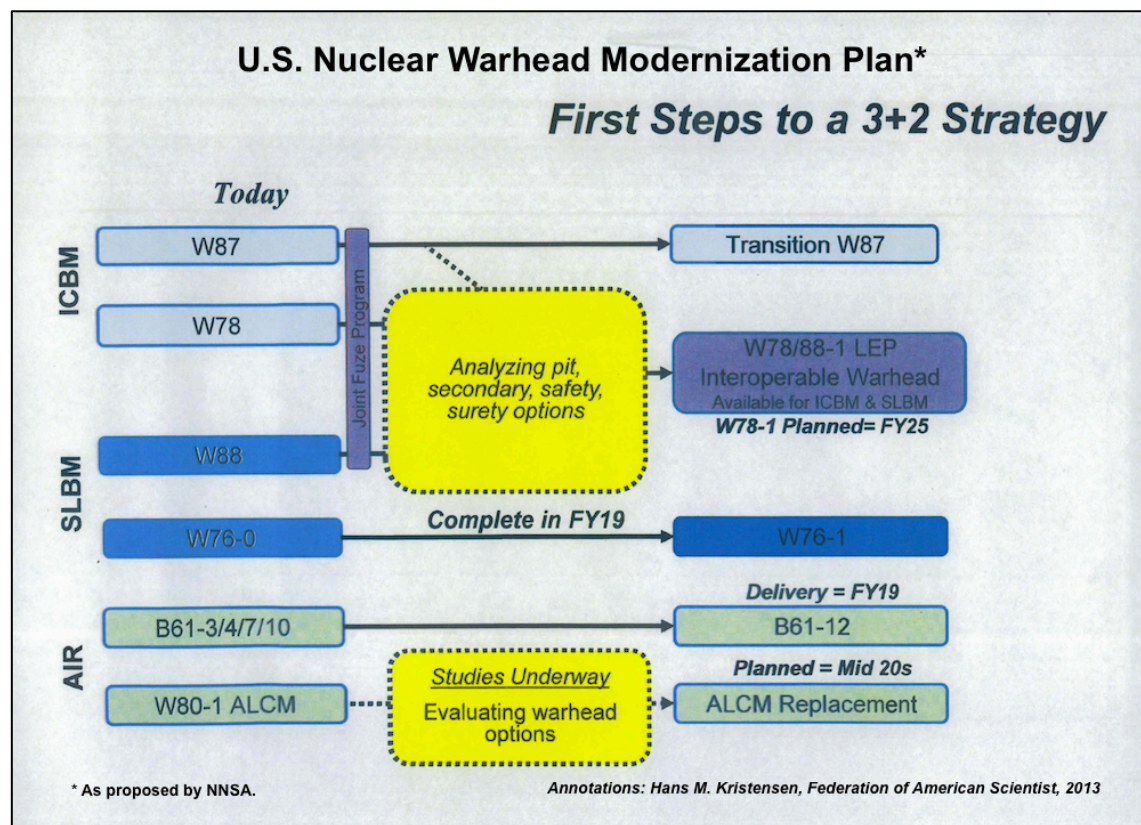
\$200 billion-plus modernization

- All three legs of strategic triad
- Tactical dual-capable aircraft
- Warhead production complex

Consolidation and modification of warhead types

Extending nuclear deterrent through 2080

## Modernizations: United States



3+2 warhead strategy: reduction from 7 warhead types to 5 types:

- 3 ballistic missile warheads
- 2 bomber warheads

W78/W88 interoperable warhead on ICBM and SLBM

B61-12: guided bomb with enhanced military capabilities

W80-1 and ALCM (LRSO)

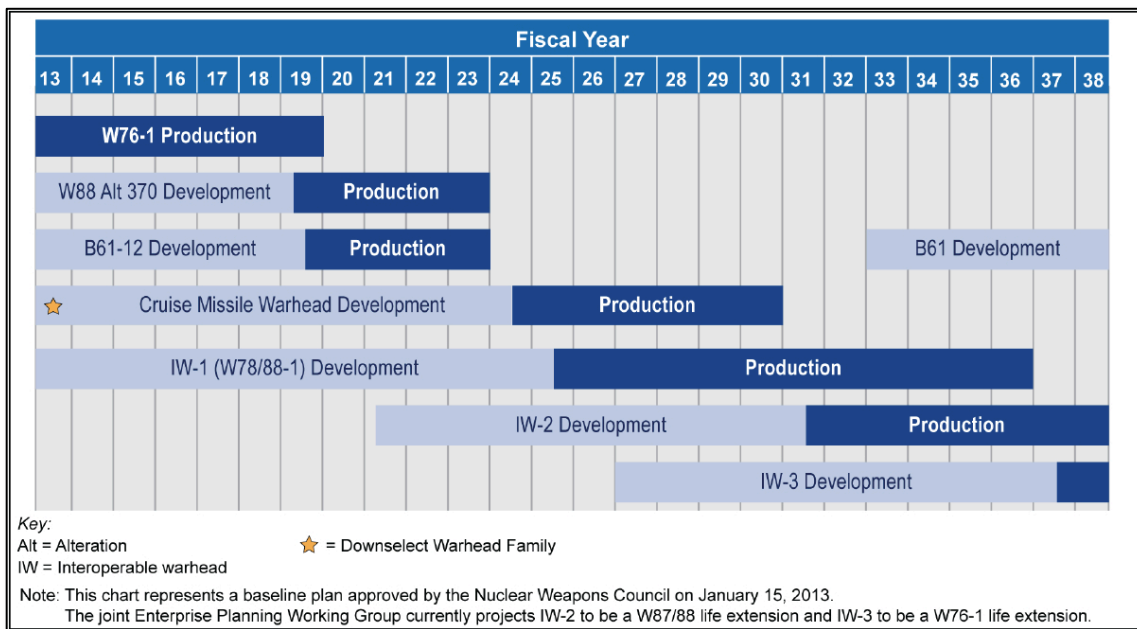
Alleged advantages:

- Fewer warhead types allow reduction of hedge
- Modified warheads with increased safety, use control, and performance margin

Possible risks:

- Modified warheads further from tested designs; reliability issues?
- Reduced stockpile diversity
- Complex and expensive programs prone to delays and cost overruns
- Modified warheads “new”?

## Modernizations: United States



NNSA warhead schedule envisions  
3 interoperable warheads

- IW1: W78/W88-1
- IW2: W61/W80-1 ?
- IW3: W87/W76-1 ?

Expensive and complex programs

Unrealistic budget estimates

Technology risks

Interoperable warheads essentially

Reliable Replacement Warheads

Contradicts pledge not to produce  
“new” nuclear warheads

## Modernizations: NATO

### Belgium

- F-35 replacement of F-16 planning?
- B61 bomb life-extension/upgrade planning

### Germany

- Tornado bomber life-extension planning?
- B61 bomb life-extension/upgrade planning

### The Netherlands

- F-35 replacement of F-16 planning
- B61 bomb life-extension/upgrade planning

### Italy

- F-35 replacement of Tornado planning
- B61 bomb life-extension/upgrade planning

### Turkey

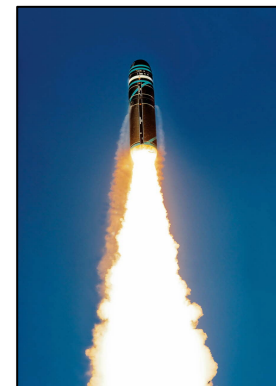
- F-35 replacement of F-16 planning
- B61 bomb life-extension/upgrade planning



## Modernizations: France

### SSBN / SLBM

- M51.1 SLBM (TN75) fielded
- M51.2 SLBM (TNO) planning
- M51.3 SLBM (TNO) planning



### Bombers

- Mirage 2000NK3 fielded
- Rafale K3 fielded
- Rafale MK3 fielded
- ALCM (ASMPA/TNA) fielded



### Infrastructure

- Megajoule at CESTA planning
- Airix/Epure hydrodynamic test center at Valduc planning (partly Joint French-UK warhead surveillance testing center)





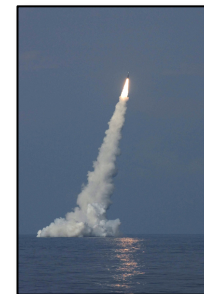
## Modernizations: Britain

### SSBN / SLBM

- SSBN (Vanguard replacement) planning (3+)
- SLBM (Trident II D5LE) planning
- Mk4A/W76-1 type warhead fielding

### Infrastructure

- Joint UK-French warhead surveillance testing technology center planning



## Modernizations: Russia

### ICBM

- SS-27 Mod 1 (silo) completed (Tatishchevo: 60) fielded
- SS-27 Mod 1 (mobile) completed (Teykovo: 18) fielded
- SS-27 Mod 2 (mobile: Teykovo (18); Novosibirsk; Irkutsk; Tagil) planning
- SS-27 Mod 2 (silo: Kozelsk; Dombrovsky) planning
- New ICBM (“heavy”; modified SS-27 (RS-26); or new) planning



### SSBN / SLBM

- Delta IV SSBN fielded
- SS-N-23 SLBM life-extension (Sineva/Layner) fielding
- Borei SSBN fielding (8)
- SS-N-32 (Bulava) fielding



### Bombers

- Tu-160 (Blackjack) upgrade planning
- Tu-95 (Bear) upgrade planning
- ALCM (Kh-102) fielding?
- New bomber (PAK PA) planning



### Tactical

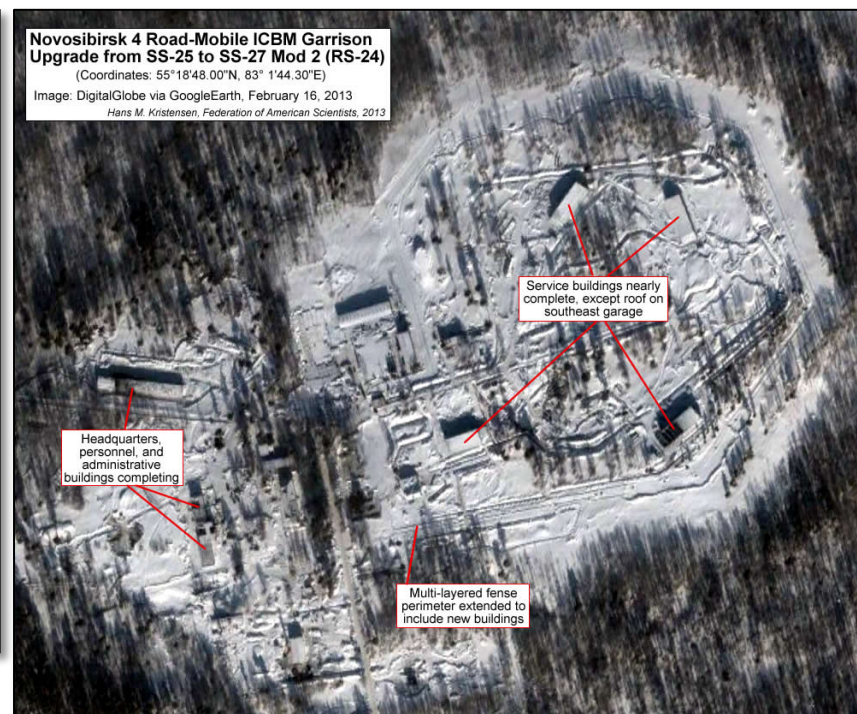
- Tu-22M (Backfire) life-extension
- Su-34 (Fullback) fielding
- Yasen (Sverodvinsk) SSGN planning
- SLCM (SS-N-30, Kaliber) planning
- SSM (SS-26, Iskander) fielding
- SAM (S-400/SA-21) fielding
- ABM (A-135) planning



## Modernizations: Russia



## Modernizations: Russia



Novosibirsk: Replacement of SS-25 with SS-27 Mod 2 (RS-24). 2008 image (left) shows old garrison layout with SS-25 TEL garages. 2013 image (right) shows TEL garages removed, upgrade of service buildings, and expansion of fence perimeter. Third of 7 missile divisions to receive SS-27 by mid-2020s.

## Modernizations: China

### ICBM / MRBM

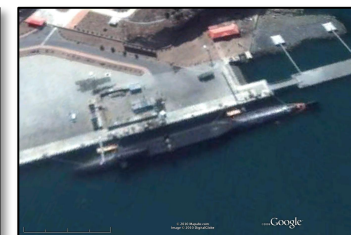
- DF-31 (CSS-10 Mod 1) ICBM fielding
- DF-31A (CSS-10 Mod 2) ICBM fielding
- DF-21 (CSS-5 Mod 1/2) MRBM fielding
- DF-41 ICBM planning (MIRV)?

### SSBN / SLBM

- Jin (Type-094) SSBN fielding (3+)
- Type-096 SSBN planning
- JL-2 (CSS-N-14) SLBM fielding

### Cruise Missiles:

- ALCM (CJ-20 on H-6 bomber) planning\*
- GLCM (DH-10/CJ-10) fielding



\* Listed in 2013 AFGSC briefing but not in 2013 NASIC report.

## Modernizations: Pakistan

### MRBM / SRBM

- Shaheen II MRBM (Hatf-6) planning
- NASR SRBM (Hatf-9) planning
- Abdali SRBM (Hatf-2) planning\*

### Cruise Missiles

- GLCM (Babur/Hatf-7) planning
- ALCM (Ra'ad/Hatf-8 on Mirage) planning
- SLCM (naval version of Babur) planning?

### Infrastructure

- Khushab-IV reactor planning

\* Listed by Pakistani ISPR but not by 2013 NASIC report.



## Modernizations: India

### ICBM / IRBM / MRBM

- Agni VI ICBM planning (MIRV)?
- Agni V ICBM planning
- Agni IV IRBM planning
- Agni III IRBM planning
- Agni II MRBM fielding

### SSBN / SLBM

- Arihant SSBN planning (3+)
- Sagarika/K-15 SLBM planning
- Dhanush SLBM planning

### Cruise Missiles

- GLCM (Nirbhay) planning\*

### Infrastructure

- Two plutonium production reactors planning

\* Reported by news media but not listed in 2013 NASIC report.



## Modernizations: Israel

### IRBM

- Jericho III IRBM planning?

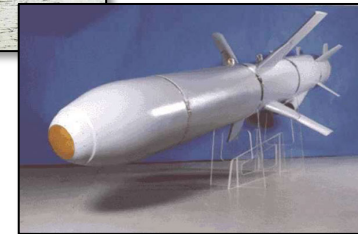
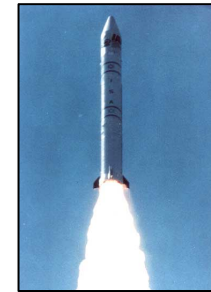
### SSG / SLBM

- Dolphin SSG fielding
- SLCM (Popeye Turbo/Harpoon) fielding?\*

### Bomber

- F-35 acquisition?

- Reported by news media but denied by officials.





## Modernizations: North Korea

### ICBM / IRBM / MRBM

- No Dong MRBM planning?
- Musudan IRBM planning?
- Hwasong-13 (KN-08) ICBM planning?
- Taepo Dong 2 SLV/ICBM planning?

### Cruise Missiles

- KN-09 coastal defense cruise missile?\*

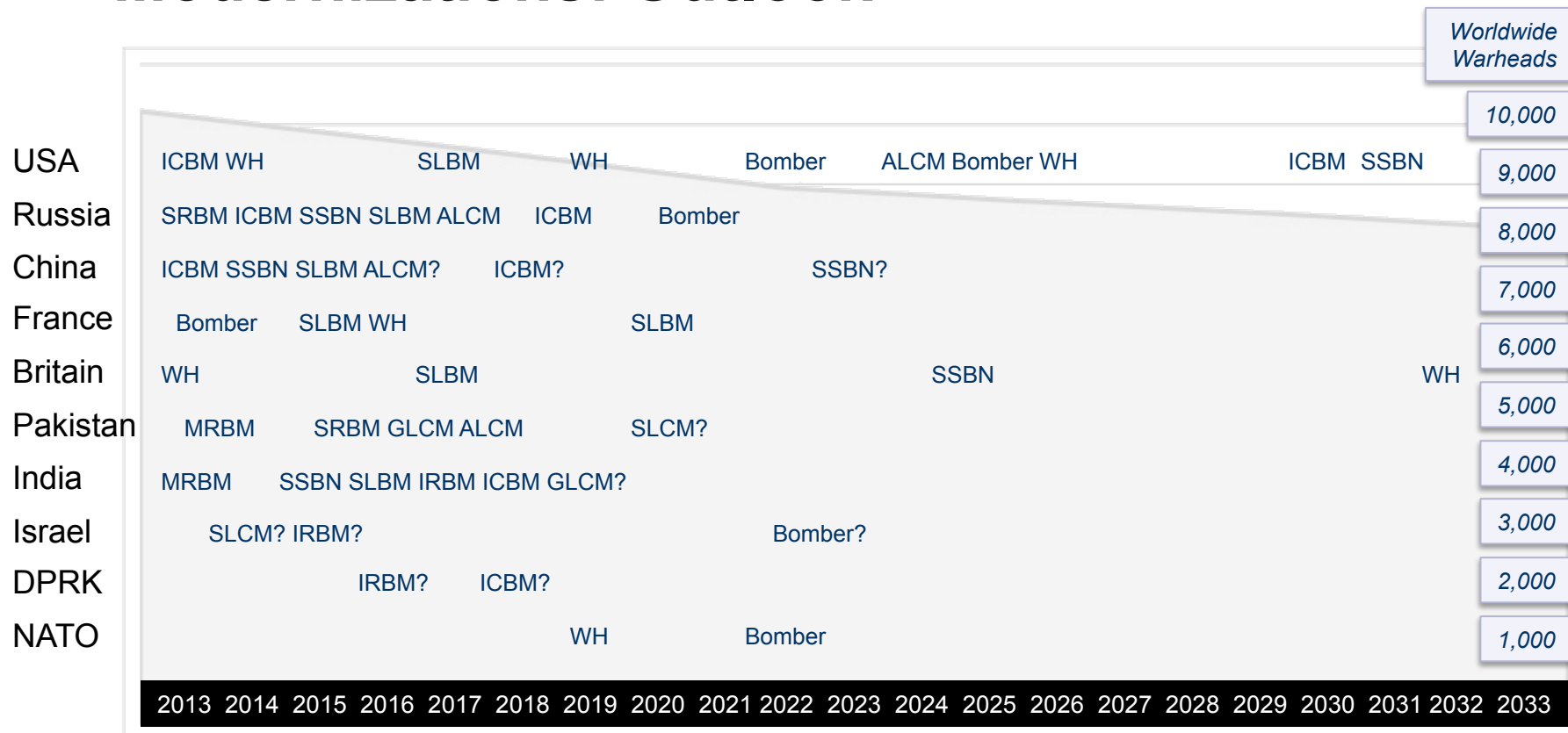
### Infrastructure

- Yongbyon plutonium production reactor re-start
- Uranium enrichment production

\* Listed by 2013 AFGSC briefing but not in 2013 NASIC report.



## Modernizations: Outlook



Key: ALCM = Air-Launched Cruise Missile; GLCM = Ground-Launched Cruise Missile; ICBM = Intercontinental Ballistic Missile; IRBM = Intermediate Range Ballistic Missile; SLBM = Sea-Launched Ballistic Missile; SLCM = Sea-Launched Cruise Missile; SRBM = Short Range Ballistic Missile; SSBN = Nuclear-Powered Ballistic Missile Submarine; WH = warhead

## Conclusions

- All nuclear weapon states have extensive and expensive nuclear weapons modernization programs underway spanning next two decades
- Programs underway include at least: 27 ballistic missiles, 8 warships, 5 bombers, 9 cruise missiles, 8 warheads, 8 factories
- Warhead inventories are decreasing in US, Russia, France and Britain but increasing in China, Pakistan, India and North Korea
- Modernizations drive suspicion, worst-case planning, and nuclear competition
- Modernizations slow or hinder nuclear disarmament efforts
- Continued modernizations contradict NPT Article VI
- Numerical warhead reductions have served primary role until now, but constraints on modernizations are needed to avoid undercutting arms control process