TRACKING NUCLEAR CAPABLE INDIVIDUALS

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- South Africa and the AQ Khan Network
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<thead>
<tr>
<th><strong>Category</strong></th>
<th><strong>States</strong></th>
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</thead>
<tbody>
<tr>
<td>Nuclear Non- Proliferation Treaty (NPT) declared nuclear weapons states</td>
<td>United States, Russian Federation (successor state to the Soviet Union), United Kingdom, France, China</td>
</tr>
<tr>
<td>Non-NPT undeclared nuclear weapons states</td>
<td>Israel</td>
</tr>
<tr>
<td>Non-NPT declared nuclear weapons states</td>
<td>India, Pakistan, North Korea</td>
</tr>
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<td>Nuclear weapons states that disassembled its arsenal before joining the NPT</td>
<td>South Africa</td>
</tr>
<tr>
<td>NATO nuclear weapons sharing states (U.S. nuclear weapons)</td>
<td>Belgium, Germany, Italy, Netherlands, Turkey, Canada (prior to 1984), Greece (prior to 2001)</td>
</tr>
<tr>
<td>Former Soviet Union nuclear weapons sharing states (Russian nuclear weapons)</td>
<td>Belarus (prior to 1996), Kazakhstan (prior to 1995), Ukraine (prior to 1996)</td>
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<tr>
<td>Aspiring nuclear weapons states</td>
<td>Iran, Burma</td>
</tr>
<tr>
<td>Nuclear capable and/or former weapons aspirant states that have renounced nuclear weapons (but who might reconsider)</td>
<td>Germany, Netherlands, Sweden, Romania, Turkey, Brazil, Argentina, Mexico, Egypt, Iraq, Syria, Libya, Saudi Arabia, Japan, South Korea, Taiwan</td>
</tr>
</tbody>
</table>
Nuclear Weapons Acquisition Paradigms

- Entrepreneurship paradigm or forward integration of the system of innovation
- Technology-economics paradigm
- Strategy paradigm
- Backwards integration of the system of innovation
Systems of Innovation

National System of Innovation

- Adoption & deployment
- Production
- Product & Process Improvement
- New Product & Process Development
- Technology Development
- Research

International transfers

- Products
- Production Know-how
- Product & Process Knowledge
- Technology
- Knowledge

Global System of Innovation

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## Nuclear Weapons Systems Hierarchy

<table>
<thead>
<tr>
<th>System</th>
<th>Level</th>
<th>Depiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational Force</td>
<td>8</td>
<td>South African Defence Force 1966 - 1994</td>
</tr>
<tr>
<td>Combat Grouping</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>User System</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Product System</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Products</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Product Sub-Systems</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Components</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Materials &amp; Processes</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
South Africa and the AQ Khan Network

- Krisch Engineering Co (Pty) Ltd
  - Agent for AEG Telefunken & Leybold Heraeus GmbH
  - 1970 – 1985: Level 1 equipment supplier to Uranium Enrichment Corporation of South Africa (UCOR)
  - Wisser, Geiges & Meyer

- 1994 – 2003: Contracted by Lerch (former employee of Leybold Heraeus) to supply gas centrifuge equipment & systems to India and AQ Khan network (Pakistan & Libya).
- Why did this happened?
Tracking nuclear capable individuals: The South African case study

- Population: Levels 3-5 former PNE & Kentron Circle/Advena personnel

- 2004 Survey:
  - Population size – 400, Sample frame - 255 (Old boys club), Sample – 118.
  - 55% had knowledge of proliferation concern.

- Problems
  - Secret dismantlement, downsizing, outdated HR records, “need-to-know” culture.
International Registry of Nuclear Capable Individuals and Organizations

- National registers
  - Resolution 1540 Committee 2008 report:
    - 36 States - reliability checks of personnel
    - 83 states - licensing of facilities or personnel.
  - Non-Proliferation Laws
    - South Africa - Act 87 of 1993 requires registration of individuals. Other countries?
- Defense export control
- Resolution 1540 - States to take cooperative action and exchanging information
- Problem areas:
- IAEA Safeguards to include international registration of nuclear capable individuals and organizations? Used to monitor and investigate suspicious affiliations and trade relations.
Conclusions

- Global pool of nuclear capable individuals and organizations is very large.
- Not all have knowledge of proliferation concern (SA: 55%).
- Some national registers are already in place.
- International register possible but difficult.
- Can be used to track and monitor the activities of these individuals and organizations.