isotope, gas centrifuge and aerodynamic U-235 enrichment methods judged as somewhat higher risk. Safeguard techniques for declared facilities of these latter two (demonstrated) methods are used but these methods, in particular, have features that make them vulnerable for clandestine HEU production in declared facilities licensed to produce low enrichments. It is also quite possible that the existence of undeclared enrichment facilities of these types could remain unidentified with existing technical means of verification alone. Only special inspections could confirm potential production capabilities of undeclared facilities of this nature, once they had been identified.

For the undeveloped non-nuclear weapon states (NNWSU), the dominant risk from undeclared sources is judged to be from clandestinely obtained weapon-grade or adequately enriched material, in some chemical form, for both U-235 and Pu-239, obtained from offshore sources rather than from indigenously-developed facilities. Verification of this type of diversion path would have to be obtained primarily from various sources of intelligence information. Electromagnetic, gas centrifuge and the aerodynamic U-235 enrichment techniques pose the next highest potential diversion risks for undeclared U-235 diversion path facilities and the highest for declared facilities. No declared electromagnetic facilities, (considered relatively low technology) and associated verification techniques currently exist. Verification aspects of declared or undeclared gas centrifuge and aerodynamic enrichment facilities would be the same as noted above for the NNWSD. Assessed as medium risk for undeclared U-235 facilities was the thermal diffusion enrichment method. This method, similar to electromagnetic enrichment, is currently ignored by developed states but could have some advantages for clandestine U-235 enrichment by NNWSU. For the Pu-239 diversion path, research reactors are the highest risk for declared facilities. Existing safeguard methods provide effective verification for research reactors, although reactor-specific safeguard resources would vary with research reactor design. For undeclared Pu-239 the risk of material obtained from smuggled sources is judged the highest, as already noted.

A verification strategy should not focus entirely on the high risk diversion scenarios identified, nor entirely on the effectiveness of a specific-facility verification technique. This type of verification regime may well result in states, with the intent of diversion, choosing paths where verification methods are not available or not applied. For non-nuclear weapon states these clandestine diversion paths might be of low efficiency, or quite different from those that a technically developed nuclear weapon state would contemplate. Smuggled acquisition, by offshore purchase or theft and the use of thermal diffusion enrichment technology are examples that may well be pursued. A verification regime covering a wide range of possible diversion scenarios, particularly those relevant to the identification of potential undeclared facilities, that currently have no existing safeguards or verification methods, is recommended. Verification methods for these undeclared facilities will primarily use technical means including various types of intelligence information, combined, when detection confidence is high, with special inspections to provide confirmation of the undeclared facility purpose. Intelligence information alone, obtained from remotely detected diversion signatures, would not in general be expected to confirm facility production capacities. A cut-off agreement should also have sufficient flexibility to be able to implement verification methods for material acquisition that are being, or may be, developed for potential future production. This would mean that the existing safeguards systems for declared facilities, of routine inspections verifying materials accounting, containment and in situ surveillance, should be strengthened by continual development.

An optimum verification regime for a given material route is not defined in this report but the analysis approach could be used to provide the technical basis for optimization, based on the generic definitions of state types. Assessment of state-specific diversion risks and an associated optimum verification regime could also be provided using this analysis approach.