WORLD NUCLEAR ASSOCIATION

Good Practice in the Compliance and Licensing of Nuclear Exports

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Contents

Abbreviations

AFCONE	African Commission on Nuclear Energy
ASNO	Australian Safeguards and Non-Proliferation Office
CAEA	Chinese Atomic Energy Authority
CFR	US Code of Federal Regulations
CoCom	Coordinating Committee for Multilateral Export Controls
COSTIND	Commission of Science, Technology and Industry for National Defence of China
C-TPAT	US Customs-Trade Partnership against Terrorism
DoC	US Department of Commerce
DoE	US Department of Energy
EC	European Council
EU	European Union
EURATOM	European Atomic Energy Community
IAEA	International Atomic Energy Agency
INCOTERMS	International Commercial Terms (published by the International Chamber of Commerce)
IP	Intellectual property
ISO	International Organization for Standardization
IT	Information technology
ITER	International Thermonuclear Experimental Reactor
KINAC	Korea Institute of Nuclear Nonproliferation & Control
LWR	Light water reactor
METI	Ministry of Economy, Trade and Industry of Japan
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
NRC	US Nuclear Regulatory Commission
NSG	Nuclear Suppliers Group
PHWR	Pressurized heavy water reactor
SCOMET	Special Chemicals, Organisms, Materials, Equipment and Technology
UAE	United Arab Emirates
UK	United Kingdom of Great Britain and Northern Ireland
UNODA	United Nations Office for Disarmament Affairs
UN SC	United Nations Security Council
USA	United States of America
USSR	Union of Soviet Socialist Republics
WMD	Weapon(s) of Mass Destruction

Executive Summary

Nuclear energy is making a growing contribution to a reconfigured low-carbon electricity supply system around the world. Trade in nuclear fuel, reactor systems and components has the potential to reach $40 billion a year, but despite the removal of many technical barriers to trade in other strategic sectors, governments continue to impose strict controls on nuclear exports.

In this report, the World Nuclear Association maps the strategic export control landscape and identifies examples of good practice by suppliers and export control authorities. We propose a number of measures for streamlining licensing and for improving communication with the industry.

Export controls aim to preclude states and unauthorized entities from acquiring materials, equipment and technology that could be used to make a nuclear or radiological weapon. The world nuclear industry contributes to countering this threat through robust internal compliance programs at company level to ensure that transactions do not involve suspect parties. Export control authorities should be able to recognize good practice by extending authorized (or trusted) economic operator status to companies that apply diligently a robust and comprehensive internal compliance program to their operations.

Most export control authorities do not issue general export licences for nuclear-related items, even though they do issue such licences for certain non-nuclear dual-use items, which places the nuclear industry at a disadvantage in comparison with the aerospace and defence industries.

The degree of scrutiny accorded to nuclear technology should be risk-based. A nuclear power reactor poses a relatively low technology risk with respect to proliferation. The same is true for components, spare parts, and maintenance or repair services for an existing nuclear facility that is subject to international safeguards. Under a risk-based approach the export of components and complete power reactors should be made possible under general authorization, without a prior individual licence, to another country that is a participating state in the Nuclear Suppliers Group (NSG), subject to notification being provided to the national authorities of the exporting and importing countries concerned. Within free trade areas, like the European Union's single market, shipments should be notifiable but otherwise unrestricted.

Nuclear fuel assemblies are composed of fissile material and therefore pose a greater proliferation risk than a nuclear reactor itself (which cannot operate without fuel). However, as nuclear fuel is normally made of low-enriched uranium it should not be subject to a requirement for licence approval prior to shipment between NSG participating states, as they have accepted International Atomic Energy Agency (IAEA) monitoring. There should be general authorization for low-enriched fuel exports with a simple reporting requirement to the strategic goods control authorities of the countries involved in the shipments.

Enrichment and reprocessing technologies are associated with a higher proliferation risk and there is thus greater justification for licensing each transaction through an individual application for export.

Resources can be better employed if exporters and governments made greater use of risk assessment. Destinations of concern could be checked out ('red

flagged'), while those that are already under international safeguards would be accepted as eligible to be fast-tracked.

The trade and investment agreements between the EU and Canada and the EU and the USA, which is being negotiated currently, offer a mechanism to address the technical barriers to trade in the nuclear sector in future. The same considerations could apply once the Trans-Pacific Partnership comes into force.

The NSG should do more to exchange information and engage with the industry. A forum for industry-regulator cooperation in the export control and counter-proliferation area involving the relevant inter-governmental organizations including the IAEA, NSG, Wassenaar Arrangement and the UN Office for Disarmament Affairs would be useful. An industry-driven road map for streamlining the international export control regime endorsed by the relevant inter-governmental organizations would make an excellent starting point.

The World Nuclear Association is ready to collaborate in building an effective and efficient export control regime, based on improved communication and a more internationally consistent approach.

1 Introduction

The civil nuclear power industry operates under a special international regulatory regime designed to ensure a high level of safety and to safeguard its technology against misuse. An overarching regulatory framework is provided by the International Atomic Energy Agency (IAEA) but authority for controlling international trade in nuclear technology, goods and services lies with national governments. Inevitably there are differences in regulation and a web of bilateral and multilateral agreements has been built up since the 1950s. Such variations may introduce additional compliance costs for global supply chains which can then hamper the development of an open international trading system.

The aim of this report is to map the strategic export control landscape and identify examples of good practice by suppliers and export control authorities. In the first half of 2013 the World Nuclear Association surveyed its membership to understand better the complexities in practice of obtaining export (and import) licences and clarify the main issues associated with compliance. It was sent to 62 organizations and 20 returns were received – a 32 percent response rate – covering 12 countries. This survey and a summary of its results are included in the Appendix.

The report concludes with some suggestions for measures to streamline licensing and to improve communication with the industry. It is hoped that this paper will contribute to building a more collaborative and internationally consistent export control regime.

This paper does not consider issues relating to export restrictions that are area or country specific.

2 An International Industry

Nuclear power is making a growing contribution to supplying low-carbon energy worldwide. There are 438 operable reactors in 30 countries. Another ten countries are building or planning to build reactors. Over 60 percent of the world's people already live in countries where nuclear-generated electricity is being supplied. By 2030 the population benefiting from nuclear power will most likely have risen from 3.4 billion to around 5.5 billion, even after allowing for the fact that a few countries (Germany, for example) have decided to phase out the technology. The spread of nuclear technology from the mature industrial economies to emerging markets is well underway.

International trade in nuclear components has the potential to reach $30 billion a year. There are today ten consolidated technology vendors offering their technology and services across much of the nuclear fuel cycle. They are AREVA, Candu Energy, China National Nuclear Corporation and the Chinese State Nuclear Power Technology Corporation, GE and Hitachi, Korea Electric Power Corporation, Mitsubishi Heavy Industries, the Nuclear Power Corporation of India, RosAtom and Toshiba/ Westinghouse. In addition, other significant technology vendors are active in the international market, including Babcock & Wilcox, China General Nuclear, Doosan and Škoda. Each has developed a supply chain that is increasingly global in scope. The World Nuclear Association's report *The World Nuclear Supply Chain: Outlook 2030* (2014) lists 240 major independent suppliers of nuclear grade structures, systems, components and services. While the industry remains weighted towards domestic markets, the leading vendors are, for the most part, internationally diversified in terms of the corporate make-up and their supplier base.

According to International Trade Centre trade statistics, the estimated value of world exports of radioactive chemical elements, including natural and enriched uranium, thorium, fabricated and irradiated fuel, and radioisotopes in 2013 amounted to $13 billion.[1] The export of natural uranium accounts for well over one half of this international trade. Natural uranium is mined in around 20 countries. It is converted into a suitable form for enrichment by companies including AREVA, Cameco, the China National Nuclear Corporation, ConverDyn, RosAtom's TVEL and Westinghouse. There are four major suppliers of enriched uranium to the world market – AREVA, RosAtom's Techsnabexport (TENEX), URENCO and the US Enrichment Corporation (USEC) – and several domestic suppliers in Argentina, Brazil, China, India, Iran, Japan and Pakistan. Twelve fuel fabricators supply low-enriched fuel assemblies, of which AREVA, Cameco, Global Nuclear Fuel (a partnership of General Electric, Toshiba and Hitachi), TVEL and Westinghouse are the largest.

Competitive pressures are encouraging the localization of manufacturing, joint ventures and international procurement of systems and components for nuclear applications. As a result, production is located in several jurisdictions with materials, semi-processed and finished fabrications perhaps crossing several borders prior to reaching the final destination for assembly and installation. Services are also performed in different countries either as a result of sub-contracting or through the participation of specialist divisions of the same transnational corporation or industrial group. Globalization, in short, is as much a part of the civil nuclear scene as it is in other industries.

[1] UN COMTRADE/ ITC trade statistics for commodity product group HS 2844. Fifteen countries account for 95 percent of uranium and nuclear fuel exports: Kazakhstan, France, Netherlands, the USA, Canada, Germany, Namibia, Uzbekistan, Russia, Belgium, Ukraine, South Africa, Sweden, the UK and China.

The rapid development of telecommunication has facilitated the intangible transfer of information while the growing amount of personal travel means that people can carry knowledge with them on electronic devices. Knowledge management processes are required within organizations to protect intellectual property and ensure compliance with export controls, but also to facilitate learning and share experience, especially in relation to safety. Though these objectives are not incompatible they call for active management.

Lastly, despite the development of regional free trade areas, such as the EU, the North American Free Trade Area, the Asia-Pacific Economic Cooperation area and others, export controls on nuclear technology, reactor components and radioactive materials are still exercised exclusively on a national basis. This situation is unlikely to change in the foreseeable future but, the World Nuclear Association believes, steps can be taken by both suppliers and export control authorities to facilitate legitimate trade and exchange.

3 The Export Control Regime

The national and international dimensions of export control have evolved since the 1950s and present a complex, and sometimes confusing, picture. The international background to the strategic export control regime is outlined in the first section. There follows a brief description of some of the main national and regional control regimes. Lastly, the key compliance requirements are explained.

Strategic export controls are part of the authorities' armoury to prevent weapons of mass destruction from being acquired by unauthorized entities. They complement the other elements of non-proliferation/ counter-terrorism strategy to protect the public against such threats and to pursue and prosecute those responsible.[2]

Implementing the strategic export control regime is achieved through a number of measures:

- Legislation to establish the appropriate competencies and enforcement processes;
- Regulation to define the technologies, goods, services and materials to be controlled (a control list);
- Export licensing of defined technologies, goods, services and materials;
- Border control activities (intelligence gathering, detection, inspection, interception, etc.);
- Financial sanctions on specified parties; and,
- Awareness-raising measures, public information and industry outreach activities.

This World Nuclear Association report focusses on the export licensing measures and makes recommendations on this area and on related industry outreach.

3.1 Background

Initially the United States was unwilling to share its expertise with its Second World War allies, and others, but within a few years came to the view that it was preferable to control the transfer of nuclear technology. Having developed an early lead in the design of atomic reactors for commercial use in the 1950s, there was interest from other countries to learn from the US experience. Accordingly President Dwight D. Eisenhower spoke of finding "the way by which the miraculous inventiveness of man shall not be dedicated to his death, but consecrated to his life", in a speech to the United Nations in 1953.

The Atoms for Peace program in the 1950s and 1960s provided financial and technical assistance, training and nuclear fuel to many countries, including India, Pakistan, Israel, Iran, Japan, South Africa, Argentina and Brazil. An International School of Nuclear Science and Engineering was set up in 1955 at the Argonne National Laboratory, Illinois, to train foreign scientists and engineers.

It sparked a similar initiative from the Soviet Union in 1955 to share its nuclear technology for peaceful purposes. The German Democratic Republic, Bulgaria, Czechoslovakia, Hungary, Poland, Romania and China were provided with technical assistance for research and development. The Joint Institute of Nuclear Research at Dubna, north of Moscow, was set up in 1956 by the USSR with its partners from Central and Eastern Europe, China, North Korea, Mongolia and Vietnam; Cuba joined in 1976.

In parallel, the International Atomic Energy Agency (IAEA) was established in 1957 to serve as an intergovernmental forum for scientific and technical cooperation in the

[2] See, for example, the UK Government's Strategy for Countering International Terrorism: Pursue, prevent, protect, prepare (March 2009) London: Cm 7547.

peaceful use of nuclear technology and to provide international safeguards against its misuse. All non-nuclear weapons states that are IAEA members are required to conclude a comprehensive safeguards agreement with the agency to ensure that fissionable materials are not diverted for military purposes. This obligation was strengthened through the adoption of the Treaty on the Non-proliferation of Nuclear Weapons (NPT). States already possessing nuclear weapons were not obliged to accept IAEA safeguards but most opened up their civil nuclear facilities to IAEA inspectors voluntarily. States that do not accept IAEA surveillance and inspection are excluded from international cooperation and trade involving nuclear technology.

The creation of IAEA safeguards enabled nuclear exports and cooperation between the Cold War blocs for the first time, with the US-organized Coordinating Committee for Multilateral Export Controls (CoCom) relaxing its embargo on nuclear exports provided that the exports would be subject to international safeguards.[3] Thus, the trade control framework began to facilitate as well as restrict nuclear cooperation.

IAEA member states are expected to introduce laws and regulations to control the management of nuclear technology, nuclear-related activities and nuclear materials.[4] These norms cover the control of imports and exports, amongst other elements. After the NPT came into force in 1970 several signatories formed an informal intergovernmental grouping in 1971, known as the NPT Exporters Committee or Zangger Committee (after its first chairman, Dr. Claude Zangger), to agree which technologies, such as uranium enrichment technology, radioactive sources and fissionable materials, should be covered by export controls. It sought to provide a common interpretation of Article III.2 of the NPT, which requires governments to control nuclear materials and certain other materials and equipment. The Zangger Committee agreed a list of goods that 'trigger' the requirement to introduce export controls and assurances that the importing state implements IAEA safeguards: the so-called 'trigger list'. The guidelines (or 'common understandings') are not legally binding.

The Nuclear Suppliers Group (NSG) was set up in 1974 by a number of countries adhering to the NPT to issue guidelines on safeguarding and controlling the international trade in nuclear and related dual-use technology, equipment and materials. The NSG's guidelines originally included two elements: a 'trigger list' which was more comprehensive than that of the one maintained by the Zangger Committee, and 'guidelines' which set out the circumstances under which nuclear exports could take place.

In the early 1990s, as the international community became more aware of the existence of clandestine nuclear weapons development programs in certain countries, the NSG guidelines were revised to address the risk that a state could covertly import strategic technologies. The guidelines concerning the trigger list (part 1 of the guidelines) were broadened to require the application of full-scope safeguards as a condition of export. A second 'dual-use list' was added (part 2 of the guidelines) covering technologies whose export would not trigger a requirement for IAEA safeguards but which would nonetheless require a licence from the national authority in the exporting state. The guidelines were also updated to include a 'Non-Proliferation Principle', whereby an exporting country's

[3] CoCom was established in 1949 with a secretariat in Paris. The founding members were the USA, the UK, Netherlands, Luxembourg, France and Belgium. Other countries joined later: Australia, Canada, Denmark, Western Germany, Greece, Italy, Japan, Norway, Portugal, Spain and Turkey. It was disbanded in 1994 and was superseded by the Wassenaar Arrangement, whose secretariat is hosted by Austria. CoCom maintained three lists: an international munitions list, an international atomic energy list and an international (industrial) list covering 'dual-use' goods.

[4] IAEA, 2012, *Guidance for sates implementing comprehensive safeguards agreements and additional protocols*, IAEA Services Series No. 21, Vienna: p. 9.

government must satisfy itself that that the transfer of technology or export of goods and services will not contribute to the proliferation of nuclear weapons or pose a risk of nuclear terrorism. If there is doubt concerning an importing country's government's intentions to comply with its commitments under the NPT (or other equivalent treaties), then the transfer or export concerned must be prohibited. In some cases the exporting country's government may request assurances from the importing country's government that the goods or technology to be supplied will not be used to make a weapon. As the NSG is not linked to the NPT, or to any other body of international law, these measures were not legally binding on participating states.

Under the NSG arrangements, countries producing the defined technologies, software, equipment and materials may only export these to those countries that have accepted the full-scope safeguards applied by the IAEA to their nuclear facilities (unless alternative exceptional arrangements are agreed). The NSG's participating governments have agreed a system for notifying each other of any decisions to restrict exports to a particular country. They apply the guidelines to each other as well as to states that are not members of the NSG. States can choose to adhere to the NSG guidelines without participating in the NSG. Most trade of nuclear technologies, equipment and materials is either between countries that participate in the NSG or involves a participating state as either a buyer or a seller, although there are some notable exceptions.[5]

The NSG and Zangger guidelines are disseminated by the IAEA.

In addition to the Zangger and NSG regimes, all governments are required to take measures to prohibit unauthorized entities and individuals from acquiring or using nuclear weapons and sensitive materials and technology, under UN Security Council Resolution 1540 of 2004. International cooperation mechanisms under the Convention on the Physical Security of Nuclear Materials (1987) and the International Convention for the Suppression of Acts of Nuclear Terrorism (2007) have also been established for detecting, countering and punishing acts of theft and smuggling of materials; the unlawful release of radioactive sources or detonation of devices; and of sabotage or attacks on nuclear facilities. The conventions oblige states to safeguard all radioactive and nuclear materials (including military stocks); to return

Participating governments of the Nuclear Suppliers Group (48 countries)

North America: Canada, Mexico, United States of America	Europe: Austria, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom
South America: Argentina, Brazil	
Asia: China, Japan, Kazakhstan, Republic of Korea, United Arab Emirates (nominated)	
Africa: South Africa	Oceania: Australia, New Zealand

[5] Australian Safeguards and Non-Proliferation Office, 2009, Nuclear Trade outside the Nuclear Suppliers Group, Briefing Paper: p. 1. States with civil nuclear capability outside the NSG include three which have never been NPT signatories (Israel, India and Pakistan) and the Democratic People's Republic of Korea, which withdrew from the NPT in 2003. Namibia, a significant exporter of uranium, is expected to apply for NSG membership.

all stolen materials and devices to the country of origin; to prosecute or extradite terrorist suspects; and to render assistance in a crisis.

A large number of countries have agreed an 'Additional Protocol' with the IAEA, since 1997. The model protocol is aimed at strengthening the safeguards system and places additional reporting requirement on IAEA member states. Article 2 (a) (ix) requires governments to provide information on the export of nuclear equipment and certain non-nuclear materials (IAEA members states are obliged to report on nuclear material transfers as part of the general safeguards regime). If requested, governments must also provide information on imports.[6] It should be noted that although natural uranium (uranium oxide, U_3O_8) is a controlled material and must be protected according to prudent practice, it is not capable of undergoing fission until after it is converted into uranium dioxide, UO_2. Uranium mines may be inspected by the IAEA under the terms of the Additional Protocol, but the mines and mills are not subject to the full safeguards applied to nuclear facilities.

The current control regime provides a 'triple lock' to prevent misuse and the proliferation of nuclear weaponry (see Figure 1). It controls the cross-border transfer of sensitive technology[7] and the transport[8] of dual-use goods, equipment and fissile materials to preclude illicit trafficking and prevent their acquisition and application by unauthorized entities or persons.

Governments have tended to emphasize the first 'lock' (on the items to be controlled) – that is, the trigger list. But arguably it is the third lock (on who is licensed to acquire and use the technology) that is most important. IAEA safeguards provide the necessary reassurance in respect of trigger list exports. But safeguards are not relevant for the exports of dual-use technology to unsafeguarded sites, and although IAEA inspectors have the right to go to any location under the terms of the Additional Protocol, some other verification mechanism might

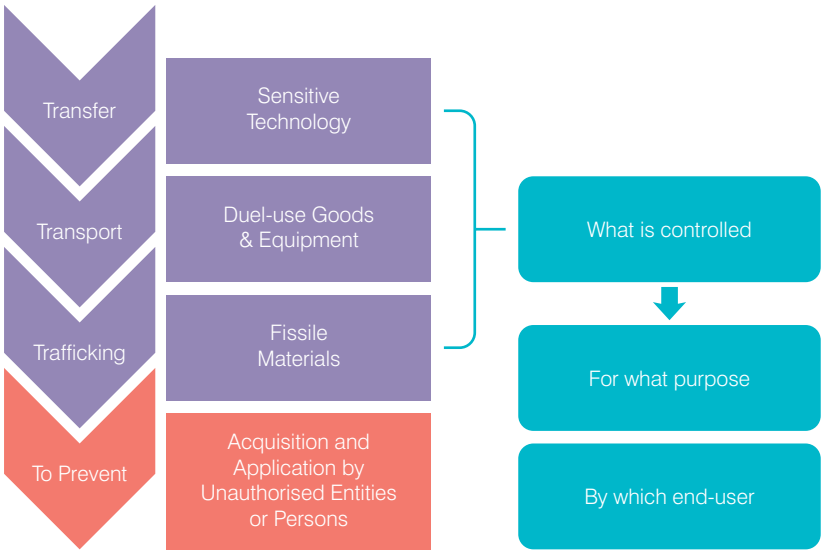

Figure 1: The 'triple lock' of the export control regime

[6] IAEA, 1997, Model Protocol additional to agreements between the IAEA and States for the application of safeguards, INFCIR/540. Annex II of the Additional Protocol specifies the equipment and non-nuclear materials that should be reported to the IAEA in the event of their export or import.

[7] Technology is defined by the NSG as the information necessary for the development, production or use of controlled items. It may take the form of 'technical data' (*e.g.*, blueprints, calculations, diagrams, formulae, models or specifications) or 'technical assistance' (*e.g.* knowledge and skills, instruction and training, or consulting services). The 1996 Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-use Goods and Technologies has the same definition but provides additional examples of what constitutes technical data and technical assistance.

[8] Transport may include trans-shipment under which the goods do not move out of a transport hub but are handed over from one carrier to another.

be needed to provide sufficient confidence. The UN Security Council's 1540 Committee, which is charged with examining the implementation of SC 1540, has considered this problem. The Committee proposed that the final recipient of the exported controlled item should be required to state what use it will make of it. Therefore, the Committee suggested, the export licence should include tougher end-user controls, with end-user certificates, and 'catch-all' clauses that require the exporter to verify the reliability of the end-user's intentions. Catch-all clauses also require exporters to consider the potential for proliferation posed by their supply of technology, goods and services, even if some items to be delivered do not appear on a control list. In effect, the exporter is required to undertake a degree of verification commensurate with the proliferation risk posed by the export.

Among the participating states of the NSG, a number have a similar approach to assessing export licence applications and to export controls, using similar definitions and classifications, restricted party lists, and end-user certification, and on re-exportation. These states include Canada, the EU member states, Japan and the USA, and although there are differences in their national export control regime, the similarities indicate a high degree of consistency.

3.2 National and regional export control regimes

The USA played a key role in establishing the international strategic export control regime and its own legislation both predated it and provided the basic parameters for the international system. We therefore describe its regime first of all and then examine those of the other major nuclear exporting countries.

United States of America

The USA developed a set of control lists and other measures, each of which are managed by different agencies: the Departments of Energy and Commerce and the Nuclear Regulatory Commission.

The following tables summarize the regulations and control lists, and their legal basis, for the countries and regions most involved in trading nuclear goods and services internationally.

Three regulatory authorities manage the nuclear export control system in the USA:

- The National Nuclear Security Administration, Department of

United Sates of America

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items: • Source material (*e.g.* natural uranium, thorium, etc.) • Special fissionable material (*e.g.* enriched uranium, plutonium, etc.) • Nuclear reactor equipment & components • Non-nuclear materials for reactors (*e.g.* graphite, deuterium, etc.) • Reprocessing plant & equipment for irradiated fuel • Fabrication plant & equipment for nuclear fuel elements • Isotope separation plant & equipment for source & fissionable material • Heavy water and deuterium plant & equipment • Uranium/ Plutonium conversion plant & equipment	Atomic Energy Act (1954) as amended Sections 123, 127, 128 and International Emergency Economic Powers Act (1977)	Nuclear Regulatory Commission 10 CFR Part 110 with Bureau of Industry & Security, Department of Commerce Export Administration Regulations – Commerce Control List Category 0
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items	Atomic Energy Act (1954) Section 57b as amended by Nuclear Nonproliferation Act (1978) Section 302	National Nuclear Security Administration, Department of Energy 10 CFR Part 810
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology	International Emergency Economic Powers Act (1977)	Bureau of Industry & Security, Department of Commerce Export Administration Regulations – Commerce Control List

Energy (DoE): DoE regulates the technology to determine that the export of such technology is not inimical to US national security or its commercial interests. Sensitive nuclear technology that requires specific authorization before it can be released includes isotope separation, fabrication of nuclear fuel containing plutonium, heavy water production and reprocessing of irradiated fuel. The DoE may decide that a Section 123 Agreement (arising from a section of the Atomic Energy Act) is required between the USA and the recipient's government to provide an assurance that the technology will not be misused for weapons purposes; such agreements take around two years to be concluded and although the Congress is only asked to consider the agreement, it can strike one down if it is not happy with it. A 123 Agreement is a reciprocal agreement and it binds the US as much as the foreign country and can thus be linked to the provision of American technical assistance to a country wishing to develop nuclear power (as envisaged in the Atoms for Peace program). DoE is introducing an e-license system but has opted out of collaborating with the proposed Export Enforcement Coordination Agency and the adoption of a single control list.

- The Nuclear Regulatory Commission (NRC): regulates the export of nuclear materials and reactor equipment and components, fuel fabrication, etc. for all foreign destinations to ensure that these are not exported to restricted or embargoed destinations as listed under US Federal Regulations 10 CFR Part 110 (these include India, Pakistan, Israel, Iran, Libya, Syria, Cuba and DPR Korea).
- The Bureau of Industry and Security, Department of Commerce (DoC): through the Export Administration Regulation, issued under the International Emergency Economic Powers Act, DoC regulates dual-use materials, components and technology. The DoC has its own control list of technologies/items and its own list of states and entities (persons/organizations) with whom commerce is restricted (including Cuba, Iran, DPR Korea and Russia).

The Department of Energy (DoE) updated parts of the regulations in March 2015 to generally authorize the transfer of nuclear technology for peaceful purposes to a range of destinations and to exempt publicly available technology and fundamental research from controls.[9]

Exports to nuclear facilities that are subject to IAEA safeguards are routinely approved. A general licence is available for the export of special nuclear material and deuterium to countries that are not on the embargoed or restricted lists. Reactor components (for LWRs and PHWRs) may be exported under a general licence to most other NSG countries: Austria, Belgium, Bulgaria, Canada, Chinese Taiwan, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Republic of Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Philippines, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the UK, along with Indonesia. A facility export licence is required for a complete or essentially complete nuclear reactor.

The transfer of non-sensitive nuclear technology is generally authorized to the member states of the EU,[10] Argentina, Australia, Brazil, Canada,

[9] US Federal Register Vol. 80, No. 35 of 23 February 2015 on Assistance to Foreign Atomic Energy Activities.

[10] Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the UK.

Chinese Taiwan, Colombia, Egypt, Indonesia, Japan, Kazakhstan, Morocco, Norway, Republic of Korea, South Africa, Switzerland, Turkey, the United Arab Emirates and Vietnam (some restrictions apply to Chile, Mexico and Ukraine). This covers the production or development of conversion, enrichment, fuel fabrication, reprocessing and reactor development technologies, provided that no sensitive nuclear technologies are involved. It facilitates bidding by US companies for projects abroad, as they will no longer have to obtain an export licence before they can prepare a tender. It also enables the exchange of technical information between a company's units located in different countries, as long as they are on the authorized list.

As is clear from the above, the USA's lists of generally authorized destinations are similar but not identical, with a number on one list but not the other: Argentina, Australia, Brazil, Croatia, Kazakhstan, Mexico, New Zealand, Norway, Philippines, South Africa, Ukraine, UAE and Vietnam. A small number of other NSG participating states are not on either US list and specific authorization of exports to these destinations is required: Belarus, China, Iceland, Russia and Serbia.

The US control lists are very similar to the NSG's trigger list and dual-use list. Changes made to the US lists are often later incorporated into the NSG lists. The information required from an applicant includes: company name, address and contact information; product to be exported; quantity and unit of measure (*i.e.*, lbs., kg); countries of origin; intermediate and end-user information.

The USA is a party to the North American Free Trade Agreement of 1994 with Canada and Mexico, but nothing in that agreement prevents any party to the agreement from taking action relating to national policies or international agreements respecting the non-proliferation of nuclear weapons (Part 8, Article 2102).

Australia

Australia is a major exporter of uranium and has instituted a tough control regime to ensure that its exports do not facilitate proliferation.

The licensing authority for uranium exports is the Ministry of Resources, Energy and Tourism. It works with the Australian Safeguards and Non-Proliferation Office (ASNO) at the Department of Foreign Affairs & Trade, whose mission is to ensure that all uranium is exported solely for

Australia

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items: • Source material (*e.g.* natural uranium, thorium, etc.) • Special fissionable material (*e.g.* enriched uranium, plutonium, etc.)	Nuclear Non-proliferation (Safeguards) Act (1987) as amended Schedule 1 and Customs (Prohibited Exports) Regulations 1958 as amended	Ministry of Resources, Energy & Tourism in association with the Australian Safeguards and Non-Proliferation Office (ASNO), Department of Foreign Affairs & Trade
• Nuclear reactor equipment & components • Non-nuclear materials for reactors (*e.g.* graphite, deuterium, etc.) • Reprocessing plant & equipment for irradiated fuel • Fabrication plant & equipment for nuclear fuel elements • Isotope separation plant & equipment for source & fissionable material • Heavy water and deuterium plant & equipment • Uranium/ Plutonium conversion plant & equipment	Customs Act (1901) Customs (Prohibited Exports) Regulations 1958 as amended and Nuclear Non-proliferation (Safeguards) Act (1987) as amended	Defence Export Control Office, Department of Defence Defence & Strategic Goods List (2011) Part 2 Category 0 with the Australian Safeguards and Non-Proliferation Office (ASNO), Department of Foreign Affairs & Trade
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items	Customs Act (1901) Customs (Prohibited Exports) Regulations 1958 as amended and Nuclear Non-proliferation (Safeguards) Act (1987) as amended	Defence Export Control Office, Department of Defence Defence & Strategic Goods List (2011) Part 2 Category 0 with the Australian Safeguards and Non-Proliferation Office (ASNO), Department of Foreign Affairs & Trade
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology		

peaceful, non-military purposes in accordance with Australia's nuclear cooperation agreements.

A completed ASO106 form or ASO110 (ASNO) is a prerequisite to obtaining the export licence. The type of information required is: Name of exporter, destination (organization and facility), type of permit, description of goods, third party involvement (organization and facility if applicable), methods of verification of goods, confirmation of readiness of destination country/organization to receive goods, an ASNO approved transport security plan (depending on category of nuclear shipment).

The Australian Customs and Border Protection issue export approval contingent on the appropriate approvals from the agencies being issued.

Canada

Canada was an early proponent of the peaceful use of atomic energy and advocate of strong counter-proliferation measures internationally.

The Canadian Nuclear Safety Commission has the authority to licence an import or export. The Trade Controls and Technical Barriers Bureau issues an export permit. The Canadian Border Services Agency will approve the shipment subject to the necessary permit having been granted.

The items in Group 3 may be exported under General Export Permit No 43 of 2 May 2012 to certain 'eligible destinations', which includes the majority of other NSG countries: Argentina, Australia, Belgium, Bulgaria, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, the Republic of Korea, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, Ukraine, the UK and the USA.

The following information has to be included in an application: applicant; exporter; consignee (both intermediate if applicable and final); description of goods (including quantity and value); origin of material; intended end use and end-user; planned shipping dates (broad range); packaging information; end-use statement from the consignee or purchaser. Additional information and supporting documentation: technical description of goods/ technology; end-use assurances; end-use certificates; international import certificates; import licences; informal end-use assurance documents; delivery verification certificates; and US export authorization (if applicable).

Canada

NSG Guidelines on	Legal Base	Licensing Authority
Export of Trigger Lists items	Export and Import Permits Act (1985, amended 2013) Export Control List SOR 89-202 (15 March 2013) Group 3	Trade Controls and Technical Barriers Bureau of the Department of Foreign Affairs, Trade and Development in association with Canadian Nuclear Safety Commission
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items	Export and Import Permits Act (1985, amended 2013) Export Control List SOR 89-202 (15 March 2013) Group 4	
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology		

China

In the 1980s and prior to joining the IAEA in 1984 China exported nuclear technology to Algeria and Pakistan without applying international safeguards. China was invited to join the NSG after acceding to the NPT in 1992 but did not do so until 2004.[11] The system for export control appears quite complex and reflects a history of changing policy priorities as China has reformed its economy and integrated internationally.

The control lists are published by the Commission of Science, Technology & Industry for National Defence (COSTIND) in association with China Atomic Energy Authority (CAEA) for nuclear technologies and related goods and services, and by the Ministry of Commerce (MOFCOM) in relation to nuclear dual-use items. In practice this means that an exporter must obtain authorization from several authorities in sequence.

COSTIND was established by the State Council in order to re-organize the high-technology sector so as to enable defence manufacturers to diversify into civilian production in the 1980s. It now plays mainly a guiding role and is jointly responsible with the CAEA for drawing up the Nuclear Export Control List. The list is practically identical to the NSG's trigger list.

The General Administration of Customs is the enforcement bureau for export control in China.

European Union

One of the three pillars of the original European Economic Community was establishment of EURATOM in 1958 to encourage the development of atomic energy for peaceful purposes, along with the creation of a single internal market. In practice, national governments and the European institutions share responsibility for energy policy and in overseeing the nuclear industry. Member states retain legal authority for the control of exports of dual-use items in order to safeguard public policy and public security. The European Council retains the right to review the operation of member states' export controls insofar as these affect exports from the EU as a whole.

The European Council has set up a common export control regime to bring about uniform and consistent application of member states' export controls and to provide a 'level playing field' for EU exporters. The first Council Regulation was promulgated in 1969 and was reformed in 2000 (EC No 1334/2000). But after further amendment the Council recast the regulation in the interest of clarity. A single export control list was adopted which applies to every EU member state. The model control list has been copied by some other non-EU countries.

The Council Regulation has been incorporated into the national legislation and regulations of each member state, usually with no further changes.

The information required in an application includes: the export country, the exporting company, the importing country, the recipient company, the contract (as a proof for the commercial transaction, INCOTERMS, country code, the value and date), company profile, project description, the nature of the

China

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items	Foreign Trade Law (1994) as amended Regulations on the Control of Nuclear Export (1997) as amended	Commission of Science, Technology & Industry for National Defence (COSTIND) in association with China Atomic Energy Authority (CAEA) Nuclear Export Control List promulgated under Decree 230 (1997 & revised 2004) of the State Council
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items	Regulations on the Import & Export Control of Technologies (2001) as amended	
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology	Regulations on the Export Control of Nuclear Dual-use Items & Related Technologies (1998) as amended	Ministry of Commerce (MOFCOM) in association with General Administration of Customs (GAC) Measures on the Administration of Export Licences on Sensitive Items & Technologies

European Union

NSG Guidelines on	Legal Base	Licensing Authority
Export of Trigger Lists items	Council Regulation (EC) No 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items and the national law of the Member State As amended by Regulation (EU) No 1232/2011 of 16 November 2011 Annex 1 Category 0 for Nuclear Materials, Facilities and Equipment	EU Member States
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items		EU Member States
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology		EU Member States

item, technical data, the name of the export controller in charge, routing of the goods, end-user certificate and perhaps additional documents depending on the individual case.

In principle, an EU-based supplier of natural and depleted uranium and nuclear fuels is not required to obtain an export licence for a shipment to a safeguarded nuclear power plant within the EU. All other nuclear exports, however, require an individual licence from the national export control authority.

Nuclear exports to another EU member state may also require official verification of the import. In some cases, the exporting member state requires a certificate, a delivery verification statement or a declaration of the foreign end-user issued by the competent authority of the importing member state that the dual-use items shall not be used for military purposes or any purpose connected with chemical, biological or nuclear weapons or missiles capable of delivering such weapons, together with information about the specific use of the dual-use items, and a declaration that such dual-use items shall not be subsequently exported without permission. Transfer or transit involving nuclear materials and radioactive sources within the EU may also require a licence from the relevant safety authority and/or the police. It is a high degree of control to exercise within the single internal market, in which each member state is subject not only to IAEA safeguards but also to those exercised by EURATOM.

A general authorization for export is valid from the EU to a number of destinations (Argentina, Australia, Canada, Iceland, Japan, Republic of Korea, New Zealand, Norway, South Africa, Switzerland, Turkey and the USA) for certain dual-use items, but this provision does not apply to nuclear technologies (Category 0). In addition, the European Economic Area, which creates a single market embracing the EU member states, Iceland, Liechtenstein and Norway, guarantees equal rights and obligations to economic operators, implying that in principle strategic export controls should be harmonized. Another EU partner state, Switzerland, has been a long-standing partner in the EURATOM research program and in the ITER project to build an experimental fusion reactor, giving its enterprises an equal right to bid for tenders and grants.

Simplification and streamlining nuclear transfers within the EU is a priority and could be achieved through an extension of the existing provisions for general licences, the

[11] China joined the Zangger Committee in 1998.

introduction of a project licence, harmonized administrative practices, and closer inter-governmental and Community cooperation through EURATOM. The EU has already simplified the terms and conditions of transfer of defence-related products within the European single market to enable importers to be certified for a general transfer licence. This enables their EU-based suppliers to transfer items without having to apply for an individual export licence. The importing company must demonstrate that its internal compliance program has provisions in place to handle any re-export activity. It simplifies the strategic export control regime for transnational operation taking place within the EU.

India

For over three decades nuclear trade with India was embargoed following its nuclear explosive test in 1974. The country remains outside the NPT and has therefore not been able to join the NSG due to objections from some of the participating governments. However India has agreed to apply safeguards to its civilian facilities under an agreement brokered by the USA in 2008 with the NSG and has started to export components and systems for nuclear power plants.

Under its agreement with the NSG, the Indian government agreed to institute a national export control system for nuclear-related material, equipment and technology. The control list of SCOMET items mirrors the NSG trigger list closely.

Japan

Japan was one of the founders of the NSG in 1975. It is a key supplier of reactor components and is active in providing technical assistance to developing countries in Asia on nuclear technology.

The Ministry of Economy, Trade and Industry (METI) is the competent authority administering export controls. Within METI, under the Trade and Economic Cooperation Bureau, is the Trade Control Department, which has four divisions. Of the four, the Security Export Licensing Division is responsible for issuing export licences. METI issues a single control list as a Ministerial Ordinance.

Required information must include: recipient and user details (name of company, address and company

India

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items	Atomic Energy Act (1962)	Department of Atomic Energy (DAE) Control List of Special Chemicals, Organisms, Materials, Equipment & Technologies (SCOMET) control list issued 2000 and updated 2013 Category 0
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items		
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology	Foreign Trade (Development & Regulation) Act (1992) Section 5 and Weapons of Mass Destruction and their Delivery Systems (Prohibition of Unlawful Activities) Act (2005)	Ministry of Commerce & Industry, Director General of Foreign Trade Control List of Special Chemicals, Organisms, Materials, Equipment & Technologies (SCOMET) issued 2000 and updated 2013 Category 4

Japan

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items	Foreign Exchange & Foreign Trade Act (1949) as amended Export Control Order Appended Table 1 Item 2 (Cabinet Order 71 of 2008)	Trade Control Department, Ministry of Economy, Trade & Industry (METI) Ordinance No 49 (1991) of the Ministry Specifying to Goods and Technologies Pursuant to the Provisions of the Appended Table 1 of the Export Control Order and the Appended Table of the Foreign Exchange Order (*i.e.* the control list)
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items	Foreign Exchange & Foreign Trade Act (1949) as amended Foreign Exchange Order Article 17 Item 2 (Cabinet Order 237 of 2008)	
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology	Foreign Exchange & Foreign Trade Act (1949) as amended Export Control Order Appended Table 1 Item 2 (Cabinet Order 71 of 2008)	

Kazakhstan

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items	Law on Export Control of Arms, Military Hardware and Dual-use Goods (1996) Law on Export Control No. 300-III (2007) as amended Government Decree No. 578 on Licensing Rules for Export & Import (2007)	Ministry of Industry & New Technologies, Department for Export Control & Licensing Government Decision No. 1282 on Approval of the Schedule of Products subject to Export Control
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items		
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology		

details); reason for the application; subject technology or component and its purpose of use; when and how these technology or component would be provided and where to be used; reference to the NSG guideline; and the effective period of the contract.

Kazakhstan

Although a successor state of the USSR, Kazakhstan's participation in the NSG lapsed in the 1990s. Following invitations to attend, the country participated for the first time as an independent state in 2002. Since then it has emerged as the world's leading uranium exporter.

Kazakhstan is in the process of establishing a common economic space as part of its membership of the Eurasian Customs Union with Russia, Armenia, Belarus and Kyrgyzstan. A single list of goods subject to prohibition or restriction on import or export within the Eurasian Customs Union and with third countries was agreed by the Eurasian Economic Commission in 2012, but at this time the list excludes items covered by the NSG Guidelines (and therefore responsibility for controls remains with the national authorities).

Republic of Korea

The Republic of Korea has recently entered the international market as a supplier of reactor technology. The country joined the NSG in 1996.

The Nuclear Export Control Division of the Korea Institute of Nuclear Nonproliferation and Control (KINAC) provides technical expertise and administrative support on licensing to the NSSC. The export control system is called YesTrade and is managed by the Korea Strategic Trade Institute.

The basic information required for an application is the applicant's details, end-use, place of origin, and commodity information (such as tariff code, control number, value, specification, etc.). Supporting documentation, such as import certificate, catalogs, etc., is also required.

Russian Federation

As a leading exporter of nuclear technology since the 1950s, the Soviet Union was an early supporter of safeguards and was among the founding nations of the NSG. The Russian Federation continued to participate when the country declared its independence and the USSR was dissolved in 1991.

The Federal Service for Technical and Export Control (formerly the USSR's State Technical Commission (GosTekhKomissiya), formed in 1973) is responsible for the licensing of dual-use items and protecting sensitive state information. It assumed responsibility for strategic export controls from the Ministry of Industry & Trade's Export Control Department in 2004. Export control lists are issued by the government after consultation with the State Duma (parliament) and industry.

As with Kazakhstan, Russia is in the process of establishing a common economic space as part of its membership of the Eurasian Customs Union. A single list of goods subject to prohibition or restriction on import or export within the Eurasian Customs Union and with third countries was agreed by the Eurasian Economic Commission in 2012, but at this time the list excludes items covered by the NSG Guidelines (and therefore responsibility for controls remains with the national authorities).

Republic of Korea

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items	Foreign Trade Act (2007) as amended Articles 19 & 20 Presidential Enforcement Decree No 20257 (2007)	Ministry of Trade, Industry & Energy (MOTIE), Nuclear Safety & Security Commission (NSSC) Consolidated Public Notice for the Export & Import of Strategic Goods No 08-118
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items	Technology Development Promotion Act (2001) as amended Presidential Enforcement Decree No 17305 (2001)	
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology	Foreign Trade Act (2007) as amended Articles 19 & 20 Presidential Enforcement Decree No 20257 (2007)	

Russian Federation

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items	Federal Law No 114 on Military-Technical Co-operation of the Russian Federation with Foreign States (1998) Resolution of the Government No 973 (2000 on the Export & Import of Nuclear Materials, Equipment, Special Non-Nuclear Materials & Related Technology	Ministry of Defence, Federal Service for Technical & Export Control
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items		
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology	Federal Law No. 183 on Export Control (1999) Resolution of the Government No 462 (2001) on Export Control of dual-application facilities and materials as well as respective technologies used for nuclear purposes	

South Africa

South Africa has a large mineral mining industry and is an exporter of uranium. During the apartheid period, the country developed a significant capability in all elements of the nuclear fuel cycle and in manufacturing and testing atomic weapons. South Africa acceded to the NPT in 1991 and joined the NSG in 1995 having dismantled its weaponry.

The Department of Minerals and Energy is responsible for the control of experts of source and special fissionable materials, of nuclear plant for processing, using or producing such materials and of nuclear technology generally.

The South African Council for the Non-proliferation of Weapons of Mass Destruction was formed under the auspices of the Ministry of Trade and Industry in 1995 to identify those goods that should be controlled and to register those persons who have custody of controlled goods. It issues import and export permits for dual-use items.

South Africa has ratified the Pelindaba Treaty of 1996 on the Nuclear-Weapon-Free Zone in Africa, which prohibits nuclear explosive devices in Africa and the dumping of radioactive wastes. The treaty set up an African Commission on Nuclear Energy (AFCONE) to encourage cooperation in the peaceful use of nuclear energy at a regional and sub-regional level and to ensure the compliance by states adhering to the treaty of their obligations to apply IAEA safeguards. AFCONE works with the African Union, whose

South Africa

NSG Guidelines on	Legal Base	Licensing Authority Control List
Export of Trigger Lists items	Nuclear Energy Act (1999) Sections 34 & 35	Department of Minerals & Energy Government Notice 207 of 27 February 2009
Transfer of nuclear technology (including information, technical data, technical assistance & training) relating to the above items	Nuclear Energy Act (1999) Sections 34 & 35	Department of Minerals & Energy Government Notice 207 of 27 February 2009
Export of dual-use materials, equipment, assemblies, parts and components, test and production equipment, software and technology	Non-proliferation of Weapons of Mass Destruction Act (1993)	The South African Council for the Non-proliferation of Weapons of Mass Destruction Government Notice 20 of 3 February 2010

aim, amongst other objectives, is the integration of African economies. South Africa is also a member of the Southern African Customs Union, with Botswana, Lesotho, Namibia and Swaziland. However, the Southern African Customs Union maintains the right of its member states to restrict imports and exports.

3.3 Key compliance requirements

The brief overview presented above shows that the majority of countries engaged in exporting nuclear goods and services are applying control lists derived from the NSG, even if some, like India, are not able to participate in the NSG's meetings. To a large extent, the definition of what items are subject to export controls has been standardized globally. This provides something of a level playing field for the industry, though there are differences in interpretation.

Differences exist in the way licensing is handled – in terms of the types of licence that may be applied for and in terms of the time taken by the export control authority to authorize the export concerned. The World Nuclear Association survey throws light on licensing experience in practice.

Export licences can take one of several generic forms:

- General licence – applies to a broad category of controlled items and requires a simple declaration by the exporter for the goods, services, etc., to be exported; it is normally granted under a streamlined procedure or requires no prior authorization or even subsequent notification.
- Individual licence – requires an application from the exporter for the export of defined goods, services, etc. to a specified destination and/or an end-user but may be granted for multiple shipments; the export control authority may consider that an assurance is needed from the importing country's government (*e.g.* a Note verbale) on the use to be made of the exported item by the end-user prior to issue of the licence.
- Project licence – may be issued where a substantial project involving capital expansion or repair of a facility would otherwise require multiple applications by an exporter; the licence would be normally granted for a specified period of time.
- Global licence – covers goods and services that are being exported as part of a government-to-government agreement and is issued to the exporter (who is under contract to one of the government parties) on the basis of a declaration by the exporter through a streamlined procedure.

National and regional export control regimes vary in terms of the types of licence they are prepared to issue, as can be seen in the Appendix.

Most export control authorities surveyed in this report do not issue general export licences for nuclear-related items, even though they do issue such licences for certain non-nuclear dual-use items. This policy puts the nuclear industry at a disadvantage in comparison with, for instance, the aerospace and defence industries. In a globalized world economy transnational companies need to be able to undertake technology transfer and move sub-components and people from one division to another across national borders. A general licence that allowed a company this freedom to transfer technology, sub-components and people between specified jurisdictions would be very helpful. At the moment Canada and the USA are able to offer general licences of this sort and provision exists for such a general licence within the European Union's regulation. The Union General Export Authorization (EU001) permits exports of some dual-use items but not those in Category 0 (nuclear technologies and materials) to Argentina, Australia, Canada, Iceland, Japan, Republic of Korea, New Zealand, Norway, South Africa, Switzerland, Turkey and the USA. There also exists a Community General Licence for intra-Community trade but its application to nuclear technology is restricted to source materials (and some special fissile materials such as low enriched uranium) and their related technology and software.

The trade and investment agreement between the EU and Canada and between the EU and the USA – the Trans-Atlantic Trade and Investment Partnership which is being negotiated currently – offer a mechanism to address the technical barriers to trade in the nuclear sector in future and establish a reciprocal export control regime including a common control list and list of authorized destinations. The same considerations could apply once the Trans-Pacific Partnership comes into force between the USA and its partners (*e.g.* Australia, Canada and Japan).

Almost all NSG participating countries control nuclear exports through the issue of individual licences, whereby an exporter is permitted to deliver a specified item to a single end-user. Some export control authorities issue multi-annual export licences for the export of the same item to the same customer. Licences for multiple shipments of the same item to the same customer are also available.

Re-export of an item after its delivery – for further manufacturing work to be performed or assembly or testing

– is hampered by an over-reliance on individual licensing.

Individual licensing of technology transfer also deters international collaboration in tendering, potentially reducing the opportunities for obtaining best value in bidding for work and the cross-fertilization of good practice and the diffusion of innovation. These barriers have been eased to a degree in the USA by the general authorization for the transfer of non-sensitive nuclear technology to the majority of NSG participating states and to the IAEA.

Only the USA, among the countries surveyed, provides exporters with the opportunity to apply for a single individual licence covering the supply of a complete reactor (plus the initial fuel-loading and supply of spare parts), in effect granting a project licence. In other jurisdictions this type of licence is not issued and so exporters must apply for several individual licences. For one on-going nuclear construction project outside the USA this has required the exporter to make 700 applications and obtain an equal number of import certificates; all of these from governments that profess to have removed trade barriers between themselves. (This figure excludes the applications made by the exporter's many suppliers under their sub-contracts.)

Greater usage of general licences and project licences need not diminish the depth of information that governments are required to supply to the IAEA under the Additional Protocol since export control authorities will continue to receive such information in the application for a project licence or if a requirement for notification of an export (or import) has been included under a general licence.

There has been an increasing tendency for governments to centralize export licensing of all dual-use technology, goods and services within a single agency and to revise older legislation that mandated responsibility to the main nuclear regulatory body. It is probably no accident that those licensing authorities achieving the quickest response time to export applications are ones where licensing has been centralized within the trade ministry.

4 Good Practice in Compliance

Good practice in export control compliance by businesses can complement the multi-lateral and bi-lateral counter-proliferation efforts by governments.

At its plenary meeting in Prague in June 2013 the NSG discussed the measures that constitute good practice in compliance; the document can be found on its website. Exporters and others, such as shippers, freight-forwarders, brokers and bankers, it is suggested, should undertake the following practices:[12]

1. Implement internal systems to ensure due-diligence checks are carried out on potential customers and business partners and the goods, software and technology that they wish to acquire, utilizing public information such as early warning lists, red-flag checklists and questionnaires provided by the United Nations, States and other parties with an interest in supporting the multilateral counter-proliferation effort, and to consult with the appropriate government authorities as necessary.
2. Monitor, collate and vet enquiries within the scope of due diligence, relating to the acquisition of proliferation sensitive goods, software and technology.
3. Consult government export control authorities before having any dealings with entities identified as being of proliferation concern either from public sources, from corporate monitoring systems or from contact with relevant competent authorities in states themselves.
4. Implement best efforts to share information about attempts to procure items for illicit weapons of mass destruction programs with security and other relevant agencies in the State where they are established and with business partners and others in instances where the State judges that broader publicity would be appropriate.
5. Promote the adoption of due-diligence and information sharing within the supply chain and with other business partners within the boundaries of legitimate protection of business and company information.
6. Incorporate counter-proliferation measures and export control compliance into existing corporate social responsibility statements.
7. Encourage relevant industry-wide trade and professional bodies to recognize the importance of supporting and encouraging the counter-proliferation effort and the measures set out herein.
8. Foster an open and transparent relationship with appropriate government and regulatory authorities.

Adoption of these examples of good practice will, in the view of several, but not all, NSG governments, enhance active commercial sector's support for non-proliferation by reducing the risk of inadvertent supply of controlled items to illicit weapons programs. An internal compliance program would normally offer a related competency-based training program for personnel, sub-contractors and suppliers.

The World Nuclear Association has not yet endorsed these practices although they were discussed with the association prior to being considered by the NSG. Nonetheless they provide a platform for further dialogue between the industry and the NSG participating governments. The good practice set out in the NSG document provides the basis for agreeing many of the key features of company internal compliance programs. If export control authorities were satisfied that an exporter's

[12] See <http://www.nuclearsuppliersgroup.org/A_test/01-eng/NSG%20Measures%20for%20industry%20update%20revised%20v3.0.pdf>

internal compliance programs was sufficiently robust and comprehensive as to meet the general obligations to safeguard nuclear technology, goods and services, both nationally and internationally, then such companies could be classified as a 'trusted economic operators'.

Trusted or Authorized Economic Operator status is already available under programs run by the US and EU customs authorities to control security during the transport of goods against theft, fraud and other crime at ports and along international supply chains.[13] Since such programs are already being implemented by the customs service of several NSG participating countries, it should be possible to extend the model to provide a more effective system of control over nuclear exports, potentially at a reduced resource cost to both governments and companies. The costs and benefits to companies of gaining a registration could vary considerably and it would be important that participation in this type of program was voluntary.

[13] The US Customs-Trade Partnership against Terrorism (C-TPAT) extends to imports not to exports and therefore the requirements for license exception would differ.

5 Good Licensing Practice

Export controls aim to preclude states and unauthorized entities from acquiring materials, equipment and technology that could be used to make a nuclear or radiological weapon. They are not intended to hinder legitimate trade and exchanges of information or persons. Governments recognize this point and in many cases have instituted target response times to applications for export licences so as to provide greater certainty to the exporter and avoid unnecessary delay. Good communication between the exporter and the licensing authority will assist both parties in assessing the proliferation risk attached to the transfer. Inter-agency communication is also important, as several agencies may be involved in export control, including the customs and border services.

The World Nuclear Association's survey shows quite a range of response times for applications.

The fastest response and approval times are reported to be achieved in Japan and the Republic of Korea (around 15 days). The next shortest approval times involve intra-EU exports, where 30 days seems to be typical.

Most NSG participating governments operate an on-line application system and in Japan this is integrated into a single consolidated system for customs and port-handling control.

The export control authority normally assigns a named case officer to handle an application for an export licence. However, in some countries, for example, the UK, the case officer is allocated a case on the basis of overall workload irrespective of the nature of the goods or technology being exported, whereas in others an application for the nuclear sector would be handled by a specialist team. The World Nuclear Association's survey provides no indication on which system is more efficient, but one respondent stated that the UK system could be improved if case officers received better training.

It should also be noted that specialist case officers will be better placed to administer a risk-weighted export control system. An export licensing system that treats all dual-use items on the control list as posing a similar level of proliferation risk will tend to encourage the licensing officials to be risk-averse and to give each application a similar degree of

Summary of responses:

How long does it take to gain an authorization? (calendar days)

	Equipment, parts and components	Software/ Technology	Material
Dual-use items	15-120 days	15-90 days	10-60 days
Items for civil nuclear power stations (sensitive)	15-90 days	15-90 days	30-90 days
Items for uranium enrichment, re-processing or heavy water (very sensitive)	90-180 days	N/A	90-365 days

An additional 12 months are required if a government-to-government assurance is needed

scrutiny. But in such a system the official does not need to possess specialist technical expertise and the profile for the job can be downgraded.[14] Moving to a risk-weighted approach will demand more expertise from the officials, but it will also allow them to concentrate their attention on those transactions that potentially pose a higher risk.

Almost all respondents highlighted the long delays involved in securing a government-to-government assurance on the ultimate recipient's use of the technology, goods or services where that is called for.

One respondent from Germany suggested that the approval time for non-nuclear dual-use items was quicker than for nuclear dual-use items. Since the questionnaire was concerned with nuclear exports this comment cannot be verified. But the likelihood is that nuclear exports are indeed examined more thoroughly than other types of dual-use exports. The finding fits into the general perception within governments that 'nuclear' poses risks that are not found in other strategic industries.

[14] A lower level post will look like a cheaper option for the public administration but it passes on a higher cost in terms of delay to the private sector as the non-specialist case officer must seek advice on technical matters from officials in other government agencies.

6 Developing Regulator-Industry Cooperation

Fuller collaboration between industry and government is critical to strengthening the strategic export control regime and nuclear security more generally. The 'triple lock' on nuclear exports implies a shared responsibility for safeguarding the technology from misuse, to which both industry and the public authorities can contribute. For the industry 'compliance' implies the existence of clearly communicated requirements on what must be done and what types of activity are prohibited. From the viewpoint of the export control authority, an application for an export licence needs to be accompanied by sufficient information to enable a determination to be made on the basis of the proliferation risk involved. Both parties require information to be able to:

- Screen customers to check if they are legitimate end-users or agents of a legitimate end-user;
- Understand the range of potential applications of the product and to 'red flag' proposed transactions where the end-use is unclear;
- Have confidence that the supply and logistics chain is secure against diversion;
- Identify suspicious enquiries, endorsements and paperwork;
- Have confidence that an exporter's internal compliance program is adequate to undertake the above activities.

Assessing the risk of diversion or misappropriation is central to the licensing process and will depend upon the quality of information available to the exporter and to the export control authority. Companies can be expected to be knowledgeable about their customers and suppliers but may lack information about the overall situation pertaining in unfamiliar markets. Governments have more resources than companies to monitor events and trends around the world but lack specialist knowledge of industry sectors and technological developments. The resources for investigating a particular end-user or potential weak links in the supply and logistical chains are always going to be constrained and governments must be prepared to provide guidance on where they consider the risks lie in relation to specific destinations and end-users (who may be hiding behind 'front companies').

A related issue is that the method used by export control authorities to determine the degree of risk is not clear to exporters. Canada, for example, provides general export licences for nuclear technology, goods and services to a number of eligible destinations. There are also banned destinations, as a result of UN Security Council mandates. But it appears that certain other destinations are worthy of greater scrutiny, even when the country is a fellow NSG government and signatory to the NPT. In such cases, the export control authority may request that the foreign ministry obtain an end-user certificate that has been certified by the government concerned, which is usually a long-drawn out process unless a nuclear cooperation agreement is in place. The implication is that NSG participating governments do not apply the same level of export control in practice. Mutual recognition that another government's controls on the re-export of strategic imports are adequate is patchy.

Thus there is no accepted calculus for risk assessment as such; the risk is adduced, it appears, from intelligence that arouses suspicion about an organization's activities or from geo-political factors. Little advice appears to be offered by

governments on how companies could in practice rate the proliferation risk posed by their products in relation to potential destinations and end-users.

Furthermore, there needs to be much closer liaison between the export control function of government and the diplomatic and security wings. The latter functions appear unaware that the long delays experienced in obtaining government-to-government assurances have detrimental effect on cross-border cooperation in nuclear new build and the refurbishment of existing nuclear power plants. The process of checking whether such assurances are necessary needs to be streamlined and the agreement of what should be fairly standard assurances, particularly between NSG member countries, should be afforded far greater priority. The improvement of the processes involved in inter-governmental cooperation in export control could be built upon the closer cooperation being achieved between national security services in combatting international terrorism, illicit trafficking and customs fraud. The regular bilateral exchange of information between countries on exports-imports is another area where cooperation between NSG participating states is possible.

Thirdly, the application of the 'catch-all' clause within the export licensing regime will not be effective without a robust and comprehensive internal compliance program at exporting companies. The degree of protection provided by the 'catch-all' clause will only be as good as the degree of due-diligence exercised by the company through its internal compliance program to ensure that its supply chain and customer base is secure – against illicit trafficking of materials, unauthorized technology transfer and IP theft, money laundering, etc. This, in turn, calls for close and continuing communication between industry and government over the size and nature of proliferation risk.

A number of further points were raised by World Nuclear Association members in the survey responses. Some areas on the NSG trigger list are treated by export control authorities as being indicative rather than definitive, according to several respondents. This has led to some differences in interpretation most notably between Germany and the UK/France. The UK and France tend to subject more items to control than does the German export control authority. It is also claimed that that US rules under the Code of Federal Regulation Part 810 are unclear.[15]

The policy on electronic transfers of technology needs to be examined at international level to scope out a more consistent and coherent strategy – this is particularly so on issues such as: server location (including cloud computing); use of laptops, hand-held devices, etc., abroad; access by third party IT support services and encryption of material. An international internal compliance standard would assist companies evaluate the degree of security provided by their procedures for data storage on such devices and could offer the reassurance necessary to government agencies and the international community. It could permit authorized company employees, such as sales personnel or maintenance technicians for example, to access controlled information and data remotely while travelling between eligible destinations.

Improved communication between industry and governments is central to the counter proliferation effort. The

[15] Pillsbury Winthrop Shaw Pittman, 2012, Report for the Nuclear Energy Institute on Nuclear Export Controls.

advice on good practice issued by some NSG governments provides a framework for establishing the scope of responsibility borne by industry but this must be complemented by better communication within and between governments and between governments and industry. There is also a role for communication at the international level given the fact that the nuclear industry is a global one.

In recent years there have been efforts made to reach out to the industry by some NSG participating governments and the United Nations Office for Disarmament Affairs (UNODA). These outreach events have enabled the nuclear industry and other sectors such as aerospace, chemicals, biotechnology, transportation, logistics and finance to discuss compliance and due-diligence issues with the international community.[16] Amongst its findings UNODA noted:

- There is broad agreement among companies that, despite business competition, non-proliferation-related information-sharing is in the interest of all private sector actors;
- There is a need to enhance a non-proliferation culture within organizations and across industry sectors;
- Industry requires clearer, standardized and harmonized legislation, particularly regarding export control lists, to facilitate compliance without hampering business procedures;
- There was broad agreement that cooperation between industry and regulators needs to be further enhanced.

In addition, the summit on nuclear security held in Seoul in March 2012 recognized the need to integrate safety and security and to strengthen dialogue between governments and industry. The IAEA International Conference on Nuclear Security in July 2013 noted the potential for industry to contribute to develop, foster and maintain a nuclear security culture.[17] At the event, the World Nuclear Association called for:

- Greater harmonization between states in setting their security regulations, thus helping to remove the challenge for industry of concurrent compliance with differing regulations;
- A stakeholder forum involving international trade associations, international standards development organizations, and inter-governmental organizations to review and exchange information on good practice in the field of nuclear security;
- A standing invitation for representative international business associations to observe and make representations to the IAEA Nuclear Security Guidance Committee on the development of nuclear security implementing and technical guides;
- The encouragement of industry outreach and dialogue by regulatory bodies and state agencies of IAEA member states.

The World Nuclear Association hopes that the international community can find a way to establish a forum for industry-regulator cooperation in the export control and counter-proliferation area, which will involve the relevant inter-governmental organizations including the IAEA, NSG, Wassenaar Arrangement and UNODA.

[16] See Report to the UN Security Council on the 'Wiesbaden Process' of 23 December 2014 to be found at <https://disarmament-library.un.org/UNODA/Library.nsf/ff5ff1f8933ca8da85257c6200626dcf/14d769a3d1f83adc85257dcb006c34b6/$FILE/S%202014%20942.pdf>.

[17] Ministerial Statement issued at the conclusion of the IAEA Nuclear Security Summit on 5 July 2013; to be found at <http://www-pub.iaea.org/MTCD/Meetings/PDFplus/2013/cn203/cn203MinisterialDeclaration.pdf>.

7 Streamlining the Export Control Regime

The safeguards regime on nuclear facilities, technology, equipment and materials overseen by the IAEA is the backbone of the international counter-proliferation system. One element of the regime is the control of exports and imports by national governments, which are obliged to report specified transfers to the IAEA. Governments are also concerned to ensure that recipients in importing countries do not misuse the technology, equipment and materials, and this obligation has been strengthened by the adoption of Security Council Resolution 1540. The World Nuclear Association recognizes that export control compliance is part of the overall system to secure nuclear technology from misuse.

But many governments appear to have added an unnecessary layer of scrutiny to the licensing process given the fact that in many instances IAEA safeguards on nuclear facilities already exist. In principle, exports to recipients whose facilities are under safeguards should not be considered a significant proliferation risk. To be sure, exports to unsafeguarded facilities – in states that have not acceded to the NPT or, say, to nuclear power plant construction sites – must be checked out thoroughly. In all cases the crucial factor is the status of the recipient: does the recipient operate a safeguarded facility or not? In the case of exports associated with the construction of a nuclear power plant a government will wish to assure itself that the plant in question will be placed under safeguard on its commissioning. They will also want to check out the status of intermediate recipients and system integrators, who may be assembling the sub-modules of the planned plant from components arriving from varying locations and suppliers.

In addition, the current strategic export control regime as it applies to nuclear technology, goods and services is out of step with the procedures applied in some other sectors, such as defence equipment. This results in the generation of multiple applications for individual export licences that consumes management time unnecessarily and creates a higher workload for government officials, which may detract from their efforts to assess higher risk transactions.

Streamlining the export control system is essential for effective compliance. Companies must be able to direct their efforts to those areas where a proliferation risk exists and be relieved of the administrative, management and investigative burden of compliance with a licensing process where the proliferation risk is already controlled by like-minded governments. The adoption of a risk-weighted approach to assessing proliferation will enable companies and export control authorities to deploy their resources more effectively. A model risk-weighting approach has been proposed by the reactor vendor and nuclear fuel supplier AREVA. Figure 2 shows an adapted version of this proposal.

A nuclear power reactor poses a relatively low technology risk with respect to proliferation. The same is true for components, spare parts, and maintenance or repair services for an existing nuclear facility that is subject to IAEA safeguards. Therefore, under a risk-based approach the export of components and complete power reactors should be unrestricted within free trade areas like the EU, subject notification at the time of shipment. It should also be possible to export components under general authorization, without a prior licence, to another country that is a participating state in the NSG, subject to notification

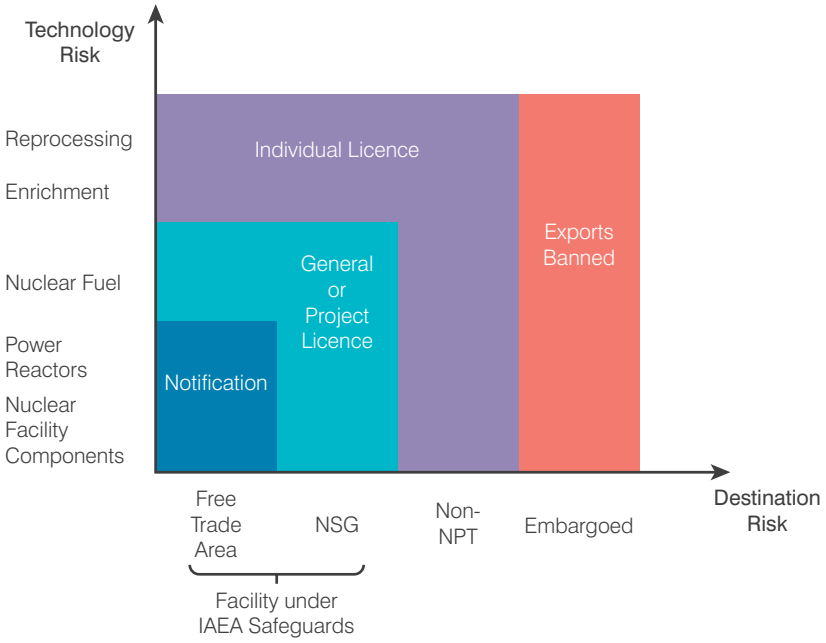

Figure 2: Model for a risk-based export control regime

being provided to the strategic goods control authorities of the exporting and importing countries concerned.

Thus companies engaged in international trade in nuclear technologies, good and services should be able to obtain a general licence to undertake their business in accordance with the reporting (and monitoring) conditions of the licence, where the destination for a controlled export is to another NSG participating state. A project licence should be required from the export control authority of the state in which the reactor vendor is domiciled for the supply of a complete (or substantially complete) nuclear reactor to another NSG participating state.

If the exporter was certified (by the customs service or an independent body) as operating a robust and comprehensive internal compliance program, the export control authority would have the assurance that the requisite notifications were being provided.

Nuclear fuel assemblies are composed of fissile material and therefore pose a greater proliferation risk than a nuclear reactor itself (which cannot operate without fuel). However, as nuclear fuel is normally made of low enriched uranium it should not be subject to a requirement for licence approval prior to shipment within the NSG, as these states have accepted IAEA monitoring under the agency's safeguards arrangements. Thus there should be general authorization for low-enriched fuel exports with a simple reporting requirement to the strategic goods control authorities of the countries involved in the shipments.

Reprocessing technology is associated with the highest proliferation risk since it involves isotope separation from used nuclear fuel that could potentially be diverted to military applications. Similar considerations apply to enrichment technology, which could be used to enrich uranium to higher fissile concentrations, suitable for some nuclear explosive devices, and there is thus greater justification for licensing each transaction through an individual application for export. A risk-based approach would suggest that individual applications for export licences should be applied even between NSG participating states to maintain a strong level of confidence between states that they remain committed to the goals of the Nuclear Non-proliferation Treaty.

In the case of countries that are not participating in the NSG and which have not ratified the NPT, all exports of nuclear technology, goods and services should be subject to prior licensing on a case-by-case basis. States under a trade embargo relating to nuclear technology are, of course, subject to a ban on relevant exports.

An issue could arise from the possibility that a recipient of an exported controlled item might in turn re-export this. But much of the international trade in nuclear technology, goods and materials takes place between NSG participating states. Therefore, in principle, these governments operate a system of export control already. Where this is not the case, the exporting country and the importing country may conclude a nuclear cooperation agreement (known as a "123 Agreement" in the USA), which commits the parties to peaceful collaboration in using nuclear technology under IAEA safeguards. There will often be a pre-existing level of government-to-government assurance regarding the general usage of nuclear technology.

Extending the trusted economic operator program to embrace export control compliance also has the potential to strengthen the overall strategic export control regime. As

the customs service already audits companies on their compliance with other aspects of customs and border control, the extension of this type of program to cover export licensing compliance could prove cost-effective in many cases, though not all companies would wish to take this up. Such an arrangement should facilitate transactions taking place between units within the same company or industrial group and between companies undertaking repeat business.

The Stimson Center, a US-based think tank focused on international peace and security issues, has suggested that industry-driven consensus standards could be developed to demonstrate compliance with international principles and guidelines and core national requirements.[18] The International Organization for Standardization (ISO) has developed a series of standards for risk management (ISO 31000 series) and a standard for internal compliance programs relating to dual-use goods and strategic technologies could be developed within this framework. Such an exercise would have to involve a range of industries, not simply the nuclear sector. Under the ISO system, organizations are certified to a standard by an independent accredited auditor. An international standard would provide the benchmark for export control authorities to award trusted economic operator status to companies and would bolster confidence in the risk-weighted model outlined above. (An export control authority would not be expected to automatically accept certification to the standard as sufficient basis to award trusted economic operator status and would be free to exercise its discretion in this regard.)

A number of other companies whose products are subject to the obligations arising from SC 1540, along with the World Nuclear Association, are seeking to define the common principles of the export control regime and to clarify, simplify and standardize the interpretation of the existing corpus of regulations and guidance governing dual-use goods.

A compliance system that strengthens the capability of the business community in preventing proliferation will provide greater assurance among governments that the strategic export control regime is working effectively. Defining an international standard for compliance related to dual-use goods and strategic technologies will take several years. Nevertheless, embarking upon a common track to strengthening and streamlining the international export control regime, with an industry-driven road map endorsed by the inter-governmental organizations (*e.g.* IAEA, NSG and UNODA), would be an excellent starting point.

[18] Stimson Centre, 2015 (forthcoming), Managing across Boundaries Initiative: Proposal for the development of voluntary consensus standards for nuclear safety and security. The proposal is intended to support the goals of the Nuclear Security Summit.

8 Summary of Recommendations

Nuclear export and import licensing has tended to focus on what is to be controlled, that is, upon the items on the control list. But, in principle, if the recipient is bone fide, then, for many controlled items the export in question should not pose a proliferation risk and could be licensed routinely. The degree of scrutiny of an application should be exercised proportionately.

Drawing upon this examination of good practice and the survey of World Nuclear Association member companies, it is proposed that the nuclear and similar industries should:

- Define the core elements for a harmonized and non-distortive export control regime and prepare a road map for its implementation by industry and the export control authorities;
- Develop an international standard of export control compliance relating to dual-use goods and strategic technologies that meets the expectations articulated in Security Council Resolution 1540 on countering proliferation and IAEA and NSG guidance, and against which performance and competence may be assessed objectively;
- Embody the practices described in the statement on good practice in compliance issued by some NSG participating states into their internal compliance programs and into such an international standard.

NSG participating governments should:

- Adopt a risk-weighted model for strategic export controls and rate control list items according to their potential to contribute to proliferation (some governments have already moved in this direction);
- Extend the remit of trusted or authorized economic operator programs run by the customs service to embrace export control compliance;
- Make greater use of general and project licensing to reduce the volume of applications and individual licences issued;
- Reduce the delays in obtaining government-to-government assurances;
- Examine the policy on electronic transfers of technology to scope out a more consistent and coherent export control strategy.

Governments, inter-governmental organizations and industry should:

- Strengthen their communication on rating the size and nature of proliferation risk from technologies and on identifying illicit procurement;
- Promote good practice in export control licensing and compliance through international, regional and national outreach;
- Agree an industry-driven road map for streamlining the international export control regime.

It is evidently important for companies involved in the nuclear sector to apply with due diligence their best efforts to integrate safety and security objectives into their operations and procedures. Effective compliance with export controls is part of this effort to maintain international and national security.

Appendix | The Export Control Survey and Results

In 2013 the World Nuclear Association surveyed its members with the following questions on experiences of export control:

1. What is the export control authority in your country?

2. Where can you find out information about export controls?

3. How do you find out that an item requires an export licence?

4. Have you found that countries interpret the Dual-Use list in different ways? If yes, please give examples.

5. How do you know which type of licence *e.g.* open, global, individual, your export control authority would allow you to apply for?

5.1 Does your country provide a specific export licence for a) spare parts; b) intra-company exports?

5.2 Is it possible for your company to apply for a long-term export licence, for example, for a long-term project?

6. Please describe the process for acquiring an individual or global licence or equivalent?

6.1 What is the process for completing an application?

a) Is there an application form? Yes ☐ ☐ No

b) Is the application form available electronically? Yes ☐ ☐ No

c) Where can the application form be found?

d) What information needs to be included in an application?

6.2 What is the process for submitting an application?

a) Can this be done online? Yes ☐ ☐ No

b) Do you receive an acknowledgement from the export control authority? Yes ☐ ☐ No

c) Do you receive an indication of the time it will take to approve the application? If so, what timescale is normally given?

6.3 Does the export control authority allocate a specific person to deal with your application?

6.4 Please describe the procedure used by the export control authority to resolve questions or obtain clarification

6.5 Does the export authority provide any explanation if a licence is refused or issued with conditions?

7. How long does it take to gain an authorization? (~weeks/months)

	Equipment, parts and components	Software/ Technology	Material
Dual-Use Items			
Items for civil nuclear power stations (sensitive)			
Items for uranium enrichment, re-processing or heavy water (very sensitive)			

8. Please describe the process for registering to use a general licence. Please set out the conditions attached to the general licences you have registered to use

9. Importing
   a) Have you imported items that were subject to another country's export controls? Yes ☐ ☐ No
   b) Did you require a licence to import such items? Yes ☐ ☐ No
   c) If yes, please provide information on the import licensing process you have to follow?

10. Re-export Controls
   a) Have you had to go back to the original licencee in order to re-export goods or technologies to a third country? Yes ☐ ☐ No
   b) If so, which countries were involved?
   c) What was the process?
   d) Were there any difficulties?

11. What are the three main factors that can create complications when applying for an export licence?

12. Are there any actions your company thinks that World Nuclear Association should pursue to try and simplify and/or streamline the process of nuclear related export controls?
   a) Within the World Nuclear Association?
   b) With individual governments?
   c) With the Nuclear Suppliers Group?
   d) With other organisations (please specify)?

13. Are there any further issues surrounding nuclear related export controls and the licensing process for either the physical exports of equipment, materials, electronic transfers of technology, or any solutions you might find useful and would like to mention?

Summary of Survey Results

Country	Licensing Authority	On-line Licensing	Licensing Processing Time	Allocated Licensing Official	Key Issues	Types of Multiple Licence Available	
						Project	Multiple
Australia	1. Ministry of Resources, Energy & Tourism 2. Defence Export Control Office, Department of Defence	Yes	3 months for sensitive 3 months+ for very sensitive 15 days for non-sensitive	Yes E-mails and face to face meetings to resolve issues as required	1. The requirement for all other approvals and information related to the export to be in place prior to granting of the Export Licence 2. Time taken to obtain the above 3. Limited capacity within government to expedite the required actions	General: No Project: No	
Belgium	Ministry of the Brussels-Capital Region	No	Dual-use material: 6 weeks to 2 months	Yes Communication through mail, letters or phone	1. The timeframe 2. Control by customs 3. Return of documents from customs and a verification of delivery causes delay	General: No Project: No	
Canada	1. Trade Controls and Technical Barriers Bureau of the Department of Foreign Affairs, Trade and Development 2. Canadian Nuclear Safety Commission	Yes	Open policy countries: standard 10 working days Other countries: 8 weeks	Yes E-mail and phone communication	1. Harmonization of standards and interpretations of those standards 2. Determining what classification product/ technology fits under in the CNSC and DFAIT Export guides 3. Cycle time for clarification with the export authority	General: No Project: No	Multi-shipment: Yes in the case of the same end-user Multiannual: Yes
Czech Republic	1. State Office for Nuclear Safety (SONS) – nuclear items 2. Ministry of Industry and Trade (MIT) – all dual-use items	Yes	Dual-use items: 30 days Others depend on the government-to-government assurance	Yes Letters, e-mails or phone calls In need of contact.		General: No Project: No	

Country	Licensing Authority	On-line Licensing	Licensing Processing Time	Allocated Licensing Official	Key Issues	Types of Multiple Licence Available	
						Project	Multiple
Finland	Ministry for Foreign Affairs		1-2 weeks If a note verbale is required several months		1. Exchange of note verbale (government to government assurance) sometimes takes a ridiculous amount of time when compared to the rest of the export authorization procedure 2. Deciding, when it is necessary to have export licence (especially technology transfers)	General: No Project: No	Multi-shipment: N/A Multiannual: Yes (up to 2 years)
France	Service des Biens à Double Usage (SBDU) Ministère du Redressement Productif	No	6-12 weeks	No. Telephone conversations or e-mail	1. Mistakes in the application resulting from misunderstanding with suppliers and customers 2. The licensing process for low risk exports take too long and require significant administrative effort 3. Customer's difficulties in providing the end-user Statement	General: No Project: No	Multi-shipment: Yes
Germany	Bundesamt für Wirtschaft und Ausfuhrkontrolle (BAFA)	Yes	Between 6 weeks and 9 months for nuclear goods (2-4 weeks for intra-EU). Very sensitive materials: up to 12 months. 4 months for nuclear dual-use items to non-EU countries (4 weeks intra-EU). 4-6 weeks (third countries) for non-nuclear dual-use items	Yes. Questions are transferred electronically via BAFA's application system (ELAN). Applicant's answers are loaded into the ELAN system as a pdf file	1. Duration of the exchange of diplomatic notes required in Germany 2. Time it takes for the Inter-agency Export Committee to consider applications for Category 0 3. Time to get the end-user-certificate from the customer. 4. Multiple licences required for one project	General: No Project: No	

Country	Licensing Authority	On-line Licensing	Licensing Processing Time	Allocated Licensing Official	Key Issues	Types of Multiple Licence Available	
						Project	Multiple
Japan	Security Export Licensing Division, Trade Control Department, Ministry of Economy, Trade and Industry	Yes The NACCS (Nippon Automated Cargo and Port Consolidated System) is an on-line system	2-4 weeks If a government-to-government assurance is needed then 3-4 months	Yes Phone calls and e-mails in if need of further contacting	1. Diplomatic process which occurs in the form of an exchange of assurances/ notes verbale is required before an application can be made for an export licence and is required in every export licence application 2. No open general licence 3. It is difficult to know if the export needs a licence 4. Preparation for enormous materials to submit to METI and complicated and time-consuming procedures	General: No Project: No	Multi-shipment: Yes under certain conditions (*e.g.* an internal compliance program for a Bulk Export Licence) Multiannual: Yes
Republic of Korea	Ministry of Trade, Industry & Energy, former Ministry of Knowledge & Economy) YesTrade, Korea Strategic Trade Institute Nuclear Safety & Security Commission	Yes	Within 15 days (excluding days of additional technical evaluation and an arrangement with the related administrative agency or field survey when needed)	Yes The application of export licence is automatically assigned to personnel in charge based on the types of goods. E-mails, phone calls or personal visits in need of further contacting	1. The time for processing of nuclear related export controls where re-export is undertaken 2. Differing interpretation of the classification of items	General: Yes for dual-use items; No for 'trigger list' items Project: No	Multi-shipment: Yes Multiannual: No (except for technology transfer agreements)
Sweden	1. Swedish Safety Radiation Authority (SSM) for Category 0 Swedish Nuclear Power Inspectorate (SKI) Inspectorate of Strategic Products (ISP) 2. Swedish Agency for Non-Proliferation & Export Control	No	Dual-use: Standard 1 month	Yes Communication is by letter and phone	1. Electronic transfers 2. Technology 3. Business travels with computer 4. Correct information on the end-use statement		

Country	Licensing Authority	On-line Licensing	Licensing Processing Time	Allocated Licensing Official	Key Issues	Types of Multiple Licence Available	
						Project	Multiple
United Kingdom	Export Control Organization, Department for Business, Innovation and Science	Yes	Sensitive nuclear technology & items: 1-3 months but up to 18 months for non-EU destinations; and 4-8 weeks within the EU Dual-use nuclear equipment, parts & components: 20-60 days	Yes A case worker. Communication through PDFs through SPIRE	1. Timing of Receipt and willingness of End-User to provide End-User Undertakings 2. Government to Government Assurances (timing) 3. Lack of available technical documentation to support application (security-related issues) 4. Agreeing a satisfactory description of technology to be transferred during company-to-company negotiations that is sufficiently descriptive for the export licensing authority and the importing state on the one hand and is not so specific that it provides no room for expanding discussions on the other 5. Case officers may lack sufficient knowledge about nuclear technology	General: No Project: No	Multi-shipment: Yes Multiannual: Yes (up to 5 years)
USA	1. Nuclear Regulatory Commission 2. Bureau of Industry & Security, Department of Commerce 3. National Nuclear Security Administration, Department of Energy	Yes	Very sensitive materials: 3-6 months, depending on end- user country	Yes Many licensing agents available, one gets allocated to an available one	1. Foreign country approvals may take months 2. Generally, few complications with getting or renewing an export licence	General: Yes Project: Yes	Multi-shipment: Yes for selected destinations Multiannual: Yes for selected destinations (up to 5 years)

World Nuclear Association
Tower House
10 Southampton Street
London WC2E 7HA
United Kingdom

+44 (0)20 7451 1520
www.world-nuclear.org
info@world-nuclear.org

The World Nuclear Association is the international organization supporting the people, technology and enterprises that comprise the global nuclear energy industry.

Our membership encompasses uranium mining, conversion, enrichment and fuel fabrication; reactor vendors; major nuclear engineering, construction, and waste management companies; and the majority of the world's nuclear generation. Other members provide international services in nuclear transport, law, insurance, brokerage, industry analysis and finance.

This report maps the strategic export control landscape and identifies examples of good practice by suppliers and export control authorities. It proposes a number of measures for streamlining licensing and for improving communication with the industry.