

A Study on Status of Overseas Export Control Self-Management Systems for Nuclear Non-proliferation

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1. Introduction

Export control has been regarded as one of the essential tools for preventing the proliferation of weapons of mass destruction (WMD) and maintaining global security and safety. In the nuclear sector, led by the Nuclear Suppliers Group (NSG), export control has been systemized to ensure that nuclear materials, equipment and technologies are not diverted for nuclear weapons purposes and to provide standardized oversight [1].

At the same time, many developed countries commonly operate Internal Compliance Programs (ICPs). These systems are designed to complement government regulations and provide greater control over their export processes [2]. Several examples include university and institute programs in the United States, as well as corporate solutions utilizing specialized compliance software and enterprise platforms.

To enhance domestic export control capabilities, KAERI has developed the internal export control management system (KAERI Export Control System, KECS), however, potential challenges remain for improvements by learning from international practices in self-management implementation.

This study aims to analyze the current status on overseas export control self-management systems by examining several approaches adopted to research institutions and corporations. The results can be applied to enhance nuclear non-proliferation efforts, particularly in the context of nuclear research organizations.

2. Overseas Export Control Self-Management Systems

In this section, we explore how institutes and companies have been operating ICPs to manage export control requirements, focusing on their key features and operational software models.

2.1 Corporate Internal Compliance Programs

Many supplier countries have been implementing ICPs not only to comply with international regimes and government regulations but also strengthen the self-regulatory capabilities of exporters and institutions.

Typically, these programs initially existed as document-based administrative systems, but now they

are integrated with software solutions and customized organizational processes to ensure regulatory compliance while maintaining operational efficiency. In some cases, institutions have developed and operated their own modules internally, similar to enterprise resource planning (ERP) systems such as internal management information systems (MIS).

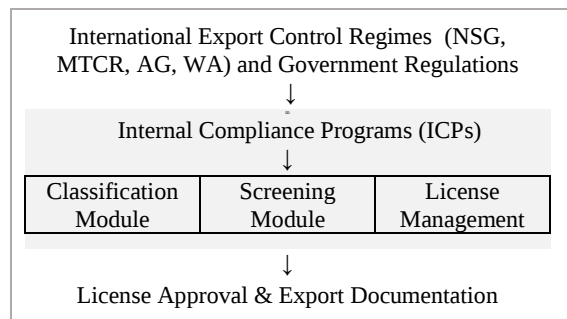


Fig. 1. Export Control Self-Management System Architecture

As illustrated in Figure 1, the architecture shows how international export control regimes are implemented into practical ICPs. The three modules - classification, screening, and license management - represent the fundamental functions that any effective export control system must perform, regardless of the specific implementation approach chosen by different organizations or countries.

2.2 University and Research Institution Cases

Universities and research institutions also have been operating export control systems tailored to their research and academic environments. This emphasizes fundamental research exemptions while maintaining strict compliance with export control regulations.

Major universities such as MIT and Harvard in the United States are operating ICPs that integrate with their research administration procedures. The Export Control Compliance Team in MIT as a centralized office, provides guidance on Technology Control Plans (TCPs) and managing fundamental classifications [3]. The system includes screening tools and maintains strict procedures for international collaboration and visitor management. Harvard operates a similar model, including the control of 'deemed export' and careful screening of foreign access to strategic items and technologies. In the UK, institution-specific compliance

frameworks with the government systems have been established especially emphasizing on dual-use technologies and risk assessment. Canadian research institutions also have compliance programs to link academic research and commercial applications under the government system.

Despite differences across countries, many institutions operate integration export control systems with existing administration processes and procedures. Typically, they have automated screening capabilities, centralized management, and regular internal compliance auditing processes. Although universities and research institutions can adjust their own compliance approaches, it is important to review how different countries have structured their export control implementation frameworks. Table I shows the several approaches adopted by major exporting nations.

Table I: Country-Specific Approaches to Export Control Self-Management Systems [4-8]

Country	Government System	Features and Management Approaches
United States	SNAP-R, DECCS	Centralized online system with institution-specific ICP development for operational efficiency
United Kingdom	LITE (replacing SPIRE)	Centralized licensing with institutional compliance frameworks and mandatory risk assessment
Canada	EXCOL	Centralized system with standardized online processing for all exporters
Germany	BAFA System	Enterprise-centered standardized procedures with government coordination
Japan	METI System	Government-guided ICP framework with industry-specific compliance tailored to business characteristics
South Korea	YESTRAD E, NEPS	Government-led licensing system with emerging institutional ICP capabilities and enhanced self-management

- SNAP-R: Simplified Network Application Process-Redesign
- DECCS: Defense Export Control and Compliance System
- LITE: Licensing for International Trade and Enterprise
- SPIRE: Strategic Platform for Import and Re-export Enhancement
- EXCOL: Export Controls On-Line
- BAFA: Bundesamt für Wirtschaft und Ausfuhrkontrolle (Federal Office for Economic Affairs and Export Control)
- METI: Ministry of Economy, Trade and Industry
- NEPS: Nuclear Export and Import Control System
- YESTRADE: Strategic Trade Management System

2.3 System Architecture and Operation Models

According to their technological infrastructure and organizational features, the overseas export control self-management systems reviewed above can be categorized as follows:

- **Software-Based Solutions:** Many organizations have adopted compliance software platforms that support key export control functions 1) classification management, 2) screening and monitoring, 3) license management.
- **Integration Models:** The integration approaches are grouped into 1) standalone system which is

operated separately from core business systems, typically used by smaller organizations with limited export activities, 2) ERP-integrated solutions which provide seamless workflow management for larger corporations with extensive global operations.

- **Operational Frameworks:** Based on organizational size and export complexity, organizations can be categorized into three - 1) centralized model which is single compliance office managing all export control activities, 2) distributed model that has multiple officers within business units or research divisions, and 3) hybrid type by combining with distributed responsibility.

These system models can improve effectiveness by streamlining screening and monitoring procedures while enhancing accuracy, knowledge retention, and cost-efficiency.

3. Implications for Nuclear Non-proliferation

The analysis of overseas export control self-management systems can provide valuable insights for enhancing nuclear non-proliferation efforts, including the context of nuclear research organizations and regulatory frameworks.

In South Korea, under the ICPs, self-classification is not permitted for nuclear-related items (i.e. trigger list items), requiring mandatory government review and approval [9]. Currently, nuclear organizations are required to obtain government classification and license approval regardless of ICP implementation through the Nuclear Export and Import Control System (NEPS) [10]. In contrast, the United States allows companies to determine Export Control Classification Numbers (ECCNs) for nuclear items under Category 0 of the Commerce Control List. While companies can review and classify items themselves, those identified as sensitive strategic items still shall require government licensing approval. It seems that this separation allows for greater industry participation in the initial screening stage. At the same time, the government could focus on and maintain strict control and rigorous review over the actual export authorization.

Currently, nuclear organizations in South Korea are required to obtain government classification and approval regardless of ICP implementation. Based on the cases reviewed above and to improve companies' internal management capabilities, we propose that the following categories could be incorporated into their systems:

- **Classification Management:** Under the responsible operational organization, a system for assessing and technological characteristics and possible ECCNs. These systems often integrate with their own product databases and technical specifications.
- **Screening and Monitoring:** Screening capabilities against restricted party lists (Denied persons or entities) with alerts and risk assessment algorithms.

- **License Management:** Electronic systems for tracking export licenses, managing licensing-relevant histories, improving transparency.

Recent solutions such cloud-based system architecture or machine learning technologies can make these systems more flexible and practical. With mobile devices and intelligent decision support programs, users can access systems freely and organize historical data more easily. These improvements can strengthen the overall nuclear non-proliferation framework by enhancing institutional capabilities while maintaining proper government oversight and security.

4. Conclusions

KAERI has been working to develop an advanced export control management system that will be effective in improving processing time, screening accuracy, internal training and knowledge retention versus manual processes.

In this study, we reviewed several overseas cases of computerized systems and self-management operations to identify valuable lessons and practices that could be applied to enhance domestic export control capabilities. As strengthening institutional export control capacity directly contributes to improving national export control effectiveness overall, nuclear organizations can also benefit from enhanced capabilities, specifically in the screening and classification stages. International cases indicate several practices that could be adapted to Korea. However, because Korea's regulatory framework is highly centralized, further studies are required to evaluate how much independence institutions should be granted while still ensuring nuclear non-proliferation. Future work should focus on developing tailored solutions that balance institutional independence with regulatory requirements to contribute to stronger overall nuclear non-proliferation efforts.

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