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# Emerging & Foundational Technology Controls: A General Overview

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## Section 1758 of the Export Control Reform Act Refers to Emerging and Foundational Technologies

- It's about technologies, both emerging and foundational.
- BIS will characterize all technologies identified pursuant to Section 1758 as "Section 1758 technologies."



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## Emerging and Foundational Technologies

- Some technologies are commercialized quickly, others remain in the research and development stage for a long time.
- A technology may be “foundational” in the sense of constituting an iterative improvement on technology already in production and used by one company, but simultaneously be “emerging” if such technology is only in the “development” stage (i.e., not in commercial use) by other manufacturers.

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## Technologies and Society

- Good use of emerging and foundational technologies:
  - Modern society and all its convenience.
- Misuse of emerging and foundational technologies:
  - Weapons of mass destruction;
  - Human rights violations;
  - Threats to national security of the U.S. and the world.

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## Emerging and Foundational Technology Controls

- In the hands of terrorists and rogue states, technologies could be indiscriminately used against any person, or any nation viewed as a target - innocent civilians could be the victims.
- As a result of the potential for misuse and the corresponding threat or danger..., controls on the transmission and transfer of technologies address not only U.S. national security concerns but also protect people around the world.

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## How Should Emerging and Foundational Technologies be Controlled?

- There is significant interest in export controls on emerging and foundational technologies.
- There are those that believe that the United States should control more, unilaterally, and faster.
- Others believe we should take a hands-off approach, or else we risk all innovation.

*Let's take some time to outline BIS's approach to these technologies.*

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## BIS's Approach to Section 1758 Controls

- First, what was BIS' approach prior to the enactment of the Export Control Reform Act of 2018 (ECRA)?
- Second, what has BIS done since the enactment of ECRA?
- Third, what are the ways in which technologies developers and stakeholders can work with BIS collaboratively to advance our shared national security priorities, while also advancing U.S. technological leadership?

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## Context of BIS Approach

- BIS takes its national security responsibilities very seriously.
- BIS is rigorous in identifying the national security and foreign policy risks of various technologies.
- BIS is methodical in learning about and understanding technologies as well as the marketplace and environment in which we're operating.

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## Shared Responsibility

- BIS is also committed to the idea of shared responsibility— export controls are most effective when applied on a multilateral basis with like-minded partners.
- This ensures maximum national security protection by limiting the ability of malign actors to access sensitive items and technologies.
- It also ensures a level playing field for U.S. industry in the global marketplace.

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## Technology Controls Pre-date ECRA

- Dual-use technologies/sensitive technologies/emerging technologies usable for the development or production of conventional weapons, chemical/biological weapons, nuclear weapons, or missiles have been subject to export control by the United States through the multilateral export control regimes, way before Emerging and foundational technology control authorized under the 2018 ECRA.

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## Multilateral Export Control Regimes

**The Wassenaar Arrangement (WA)**  
 Started in 1995, focuses on export controls for conventional arms and dual-use goods and technologies, has 42 member countries.

**The Nuclear Suppliers Group (NSG)**  
 Started in 1992, focuses on export controls for nuclear weapons, has 48 member countries.

**The Australia Group (AG)**  
 Started in 1985, focuses on export controls for chemical weapons precursor chemicals, has 42 member countries.

**The Missile Technology Control Regime (MTCR)**  
 Started in 1987, focuses on export controls for missiles capable of delivering weapons of mass destruction, has 35 member countries.

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## Export Control Reform Act (ECRA)

U.S. Congress  
*Export Control Reform Act*  
 (ECRA) of 2018



To establish appropriate controls on the export, reexport, or transfer (in-country) of emerging and foundational technologies essential to the national security of the United States

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## ECRA and Section 1758 Control Process

- Use of the Interagency, Technical Advisory Committees, public and classified information.
- In developing Section 1758 controls, BIS must consider:
  - *The development of emerging and foundational technologies in foreign countries;*
  - *The effect export controls may have on the development of such technologies in the United States; and*
  - *The effectiveness of export controls on limiting the proliferation of emerging and foundational technologies in foreign countries of concern.*

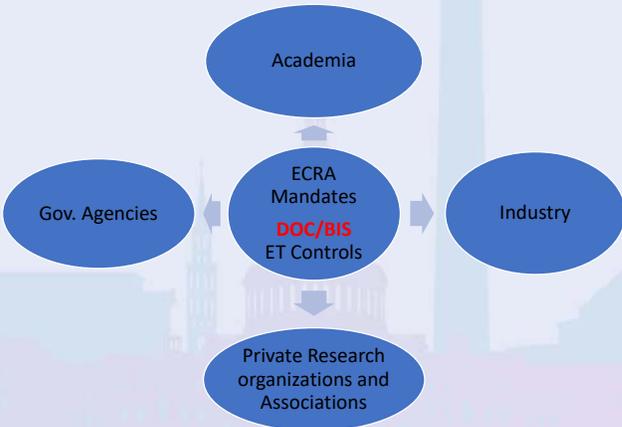
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## Technology Developers and Stakeholders



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graph TD
    Academia --- ECRA[ECRA Mandates  
DOC/BIS  
ET Controls]
    Gov_Agencies[Gov. Agencies] --- ECRA
    Industry --- ECRA
    ECRA --- Private_Research[Private Research  
organizations and  
Associations]
  
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## Advance Notice of Proposed Rulemaking (ANPRM):

- November of 2018: ANPRM seeking public comments on criteria for identifying emerging technologies.
- August of 2020: ANPRM seeking public comments on criteria for identifying foundational technologies.
- Comments were received from universities, industries, government and private research laboratories, science and technology organizations and associations, private individuals, etc.

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## The 2018 ANPRM and the 14 Technology Categories

(1) Biotechnology	(8) Logistics technology
(2) Artificial intelligence (AI) and machine learning technology	(9) Additive manufacturing.
(3) Position, Navigation, and Timing (PNT) technology	(10) Robotics
(4) Microprocessor technology	(11) Brain-computer interfaces
(5) Advanced computing technology	(12) Hypersonics
(6) Data analytics technology	(13) Advanced Materials
(7) Quantum information and sensing technology	(14) Advanced surveillance technologies

Note: These categories are NOT the ET/FT to control.

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## Each of the 14 Categories has Subcategories

Take, for example, **Artificial intelligence (AI) and machine learning technology**:

- (i) Neural networks and deep learning (e.g., brain modelling, time series prediction, classification);
- (ii) Evolution and genetic computation (e.g., genetic algorithms, genetic programming);
- (iii) Reinforcement learning.
- (iv) Computer vision (e.g., object recognition, image understanding);
- (v) Expert systems (e.g., decision support systems, teaching systems);
- (vi) Speech and audio processing (e.g., speech recognition and production);
- (vii) Natural language processing (e.g., machine translation);
- (viii) Planning (e.g., scheduling, game playing);
- (ix) Audio and video manipulation technologies (e.g., voice cloning, deepfakes);
- (x) AI cloud technologies; or
- (xi) AI chipsets.

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## Various Technology Category Lists

- In addition to BIS, other government agencies have published technology category lists.
  - For example: in 2020, the White House published the National Strategy for Critical and Emerging Technologies, with an Annex that contained a list of Critical and Emerging Technology fields.
  - In 2022, the White House published the “Critical and Emerging Technologies List Update ,” which revised the 2020 listing.
- These lists are consistent with the categories identified in the 2018 BIS ANPRM.
- These lists are intended to be dynamic, to be updated, to account for the changing science/technology landscape and the unprecedented pace of technological innovations.
- These lists are intended to serve as guide for identifying emerging technologies; they are NOT the technologies to be controlled.

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## What are the Actual Section 1758 Controls ?

- An actual Section 1758 control is an Export Control Classification Numbers (ECCN) listed on the Commerce Control List (CCL).
- It must be a commodity/technical information/software.
- Below is a schematic process of establishing a Section 1758 control. An item is:
  - identified, assessed, discussed by interagency groups and TACs,
  - determined to qualify as an emerging or a foundational technology,
  - published as NOI (notice of inquiry) or ANPRM (advance notice of proposed rule making) for feedback,
  - taken to multilateral export control regimes for discussions and adoption, and if agreed upon, then
  - published in the *Federal Register* as an ECCN with specific parameters and reasons for control.

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## Section 1758 Controls to Date

- BIS has established 38 emerging technology controls, so far, mostly in agreement with the Wassenaar and the Australia group.
- There is no special section in the EAR where these controls are enumerated/listed.
- A section 1758 control, emerging or foundational control, is/can be:
  - A modification of an existing control (existing ECCN - Export Control Classification Number),
  - A new subparagraph added to an existing control (ECCN), or
  - A new standalone control (ECCN).

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## The 38 Controls under Section 1758 Control

WA 2018

- 1) ECCN 3A001.b.3.f (certain microwave transistors, a major component of wideband semiconductors)
- 2) ECCN 3D005 (continuity of operation software)
- 3) ECCN 5A002.a.4 (postquantum cryptographic algorithms)
- 4) ECCN 6A001.a.1.b.1; .a.2; .a.2.a; .a.2.a.6 (underwater transducers designed to operate as hydrophones)
- 5) ECCN 9A004.g (aircraft platforms specially designed or modified to be air-launch platforms)

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## The 38 Controls under Section 1758 Control

WA 2019

- 6) ECCN 2B001.a, .b or .c (hybrid additive manufacturing/computer numerically controlled tools)
- 7) ECCN 3D003 (computational lithography software designed for the fabrication of extreme ultraviolet masks)
- 8) ECCN 3E004 (technology for finishing wafers for 5nm production)
- 9) ECCN 5A004.b (forensics tools that circumvent authentication or authorization controls on a computer and extract raw data)
- 10) ECCN 5D001.e (software for monitoring and analysis of communications and metadata acquired from a telecommunications service provider via a handover interface)
- 11) ECCN 9A004.h, 9A515.a (sub-orbital craft)

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## The 38 Controls under Section 1758 Control

AG 2020

- 12-35) ECCN 1C350.d (24 chemical weapons precursors)
- 36) ECCN 2B352.b.2.b (single-use biological cultivation chambers with rigid walls)
- 37) ECCN 0D521 (software related to analysis of geospatial imagery) **[Unilateral]**
- 38) ECCN 2D352 (Software designed for nucleic acid assemblers and synthesizers)

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## Proposed Section 1758 Controls on Four Marine Toxins (May 23, 2022)

- ECCN 1C351.d. (the synthesis and collection of four marine toxins (brevetoxin, gonyautoxin, nodularin and palytoxin))
- Amendments to Reflect the Proposed Reordering of Toxins in ECCN 1C351.d include, among other things
  - Expansion of ECCN 1E001 to control “technology” for the “development” or “production” of the four marine toxins

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## Section 1758 Controls Require Collaboration

Collaboration through interaction with technology developers and stakeholders, interagency entities/groups, Technical Advisory Committees (TACs), Intelligence Communities, and the general public.

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## Collaboration = Getting Involved

- Provide inputs on ANPRMs, NOIs (Notices of Inquiries) or proposed rules that appear in the Federal Register.
- Become member of a Technical Advisory Committee (TAC) - Technical Advisory Committees (TACs) advise the Department of Commerce on the technical parameters for export controls applicable to dual-use commodities and technology and on the administration of those controls. More details are on BIS Website: <https://tac.bis.doc.gov>

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## Section 1758 Controls = Work in Progress

- Technologies evolve: some become obsolete, new ones emerge.
- Hence, Section 1758 Controls can only evolve with evolving technologies.
- Work in progress must be collaborative and inclusive
  - Internationally, working with allies and partners and through multilateral export control regimes.
  - Nationally, working through interagency process, and with technology developers and stakeholders.
- Your participation to this conference also feeds into this work in progress.

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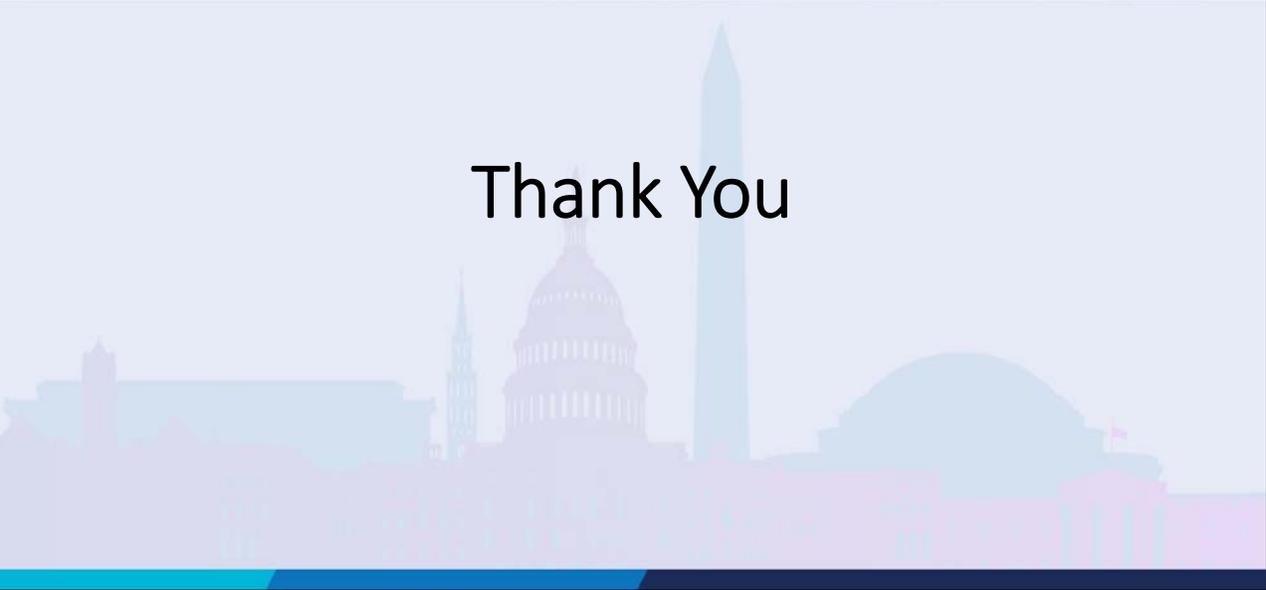
## Conclusion

BIS looks forward to working with all technology developers and stakeholders for this challenging task of identifying emerging and foundational technologies essential to US national security and applying appropriate controls that protect US innovations while stopping these technologies from being illegally acquired and utilized by entities and countries of concern.

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# Thank You