Emerging and Foundational Technology Controls

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Technology

- Technology is about translating knowledge/science into practical applications

- Conceiving, designing, producing…

  - Crafts/tools
  - New or improved methods, systems, techniques

  …to meet needs/solve problems

Emerging Technology (ET)

- Emerging technologies are rarely predicted.
- Technology may emerge today, and by tomorrow, it's already being used in all types of applications.
- Not all emerging technologies make it past research and development stage.
- Emerging technologies are those recently-developed or developing technologies not currently controlled for export that are essential to the national security of the United States and warrant implementation of export controls.

Technology, ET & Society

- Good use of emerging technologies:
  - Modern society and all its convenience.

- Misuse of emerging technologies:
  - Weapons of mass destruction;
  - Human rights violations;
  - Threats to national security of the US and the world.

Technology/ET Control

- ET in the hands of terrorists and rogue states are indiscriminately used against anyone, any nation, seen as a target - innocent civilians are often the victims.

- Because of the misuses, the threats and the dangers …, some forms of control on transactions and transfers of emerging technologies is good for the world.

How to Go about ET Control ?

- There is significant interest in export control of emerging and foundational technologies.
- There are those that believe we should control more, unilaterally, and faster.
- There are those that believe we should take a hands-off approach, or else we risk all innovation.
- Today I will take some time to outline BIS's approach to these technologies.

BIS Approach to ET Control

- First, I will outline BIS' approach prior to enactment of the Export Control Reform Act of 2018 (ECRA).
- Second, I will cover what BIS has done and is doing since enactment of ECRA.
- Third, I hope to identify the ways in which you, your universities, and other partners can work with BIS collaboratively to advance our shared national security priorities, while also advancing U.S. technological leadership.

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.

Shared Responsibility

- BIS is also committed to the idea of shared responsibility—As ECRA acknowledges, and we have seen time and again in practice, 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.

ET Control Pre-dates ECRA

- This general approach is not new—BIS applied this approach before ECRA, and BIS continues to apply it today.
- BIS has always understood that we need to gain understanding of the entire lifecycle of a technology—from early research and development, to commercialization, to broad application, and finally, to new uses for broadly applied technologies.
- BIS's implementation of controls on emerging technologies pre-dates ECRA in the sense that emerging technologies have always been dealt with through multilateral export control regimes.

Multilateral Export Control Regimes

Wassenaar Arrangement

- The Wassenaar Arrangement (WA) started in 1995. Focus: Export Controls for Conventional Arms and Dual-Use Goods and Technologies.
- The WA establishes lists of items for which member countries are to apply export controls. There are 42 members, including the US.

Nuclear Suppliers Group

- The Nuclear Suppliers Group (NSG) started in 1992. Focus: stemming the proliferation of nuclear weapons. The NSG has 48 member countries, including the US.

Multilateral Export Control Regimes

Australia Group

- The Australia Group (AG) started in 1985, prompted by Iraq's use of chemical weapons during the Iran-Iraq War (1980-1988). Focus: harmonization of international export controls on chemical weapons precursor chemicals. Today the AG is composed of 42 member countries, including the US.

Missile Technology Control Regime

- The Missile Technology Control Regime (MTCR) started in 1987. Focus: limit the proliferation of missiles capable of delivering weapons of mass destruction. Member countries coordinate their national export controls to stem missile proliferation. The MTCR now has 35 member countries, including the US.

Multilateral Export Control Regimes

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

Export Control Reform Act (ECRA)

U.S. Congress

Export Control Reform Act (*ECRA*) of 2018

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

Section 1758 of ECRA

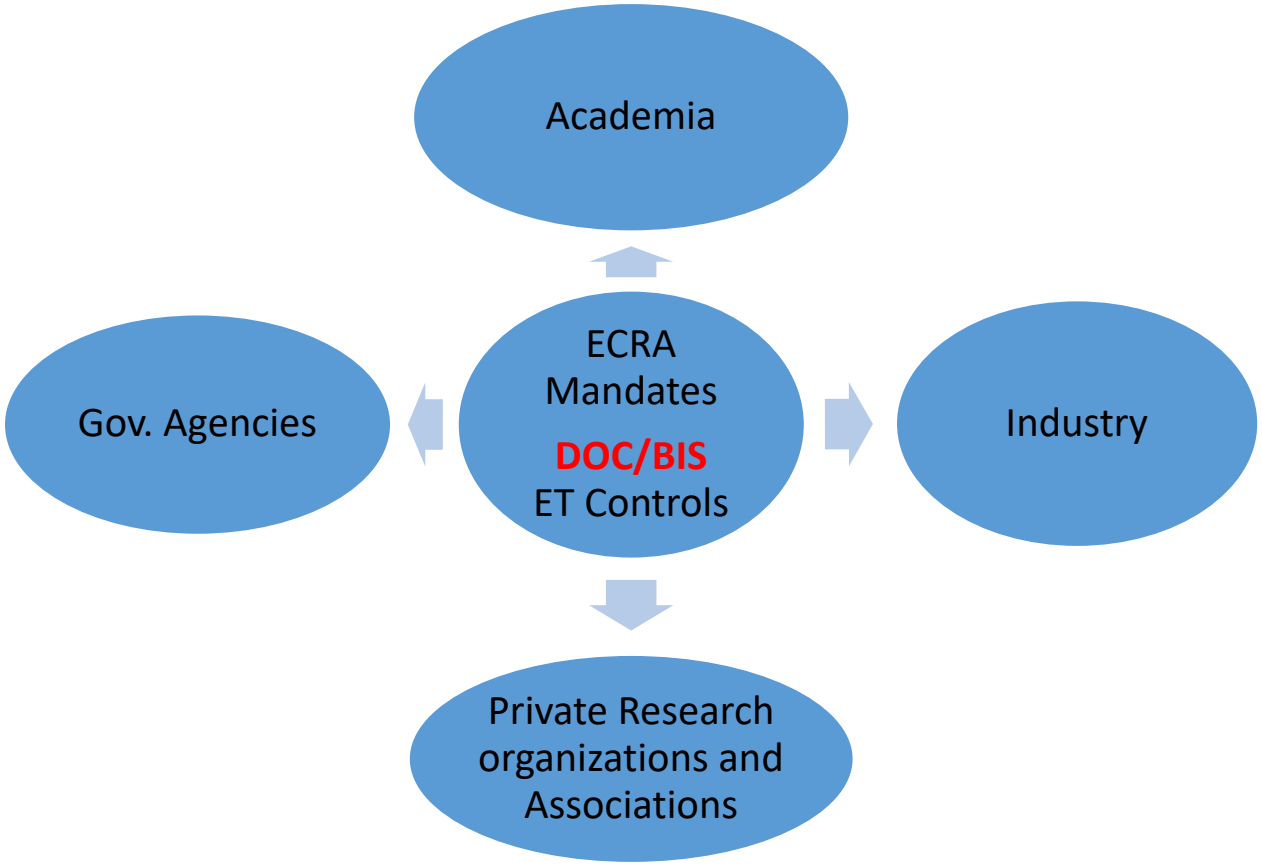
- Congress enacted the Export Control Reform Act in 2018 (the Act or ECRA).

- Section 1758 of the Act authorizes Commerce to establish appropriate controls, including interim controls, on the export, reexport, or in-country transfer of emerging and foundational technologies that are essential to the national security of the United States.

ECRA and ET Control Process

- Use of the Interagency, Technical Advisory Committees, public and classified information.
- In developing ET 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.

ET Developers and Stakeholders



Advance Notice of Proposed Rulemaking (ANPRM)

- In November of 2018, BIS published the Advance Notice of Proposed Rulemaking (ANPRM) to seek public comments on criteria for identifying emerging technologies.
- The public comments received to date are from universities, industries, government and private research laboratories, science and technology organizations and associations, private individuals, etc.
- The ANPRM identified 14 general areas/categories of science/technology for review for potential emerging technologies that may arise and may be determined to be essential to the national security of the United States.

The 14 Technology Categories Listing

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

These categories are NOT the ET/FT to control.

Each Category Has Subfields/Subsets

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.

Various Listings

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

What are ET controls ?

- ET controls are the actual ET Export Control Classification Numbers (ECCNs) incorporated into the Export Administration Regulations (EAR)
- The ET ECCNs are to be:
  - identified, assessed, discussed by interagency groups,
  - formulated as rules,
  - 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, then if agreed upon
  - published in the *Federal Register* as ET control and incorporated in the EAR.

  Only then, an ET control is established (with appropriate reason for control and license requirement)

ET Controls to Date

- Through interagency and multilateral export control processes, 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 ET controls are enumerated/listed.

- ET controls are/can be:
  - Modification(s) of existing controls - ECCN (Export Control Classification Number),
  - New subparagraph(s) added to existing controls - ECCN (Export Control Classification Number), or
  - New controls - ECCN (Export Control Classification Number).

38 ET Controls to Date

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 specially designed or modified to be air-launch platforms)

The 38 ET Controls to Date (cont.)

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)

The 38 ET Controls to Date (cont.)

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)

BIS to Universities, ET Developers and Stakeholders

ET control are all about protecting U.S. innovations and intellectual property and leveling playing field.

(1) BIS cannot impose control just for the sake of it, and thus stifle innovations and ET development.

- BIS is aware not to establish controls that would hinder/stifle research and innovation in the US.
- That's why BIS has fundamental research carved out, and License Exceptions in place, to allow for legitimate collaboration work and transactions.
- But BIS cannot standby idle and watch other countries use theft and illegal means to obtain innovations and intellectual properties US ET developers work hard for and heavily invest in.

BIS to Universities, ET Developers and Stakeholders

(2) BIS' mechanism for assessing and evaluating ET for possible controls involves interactions with ET developers/stakeholders, interagency entities/groups, Technical Advisory Committees (TACs), Intelligence Communities, to ensure that

- the ET controls once established are appropriate,
- the impact of such controls on the development of the ET in the US will not be negative,
- foreign availabilities are well assessed in order not put US ET developers in disadvantaged position, and
- the ET controls are effective in stopping destinations of concern from obtaining these emerging technologies.

=> Hence, ET control is about protection and leveling the playing field for US ET developers and stakeholders.

BIS Intends to Develop and Maintain Working Relationships

- For mutual trust because we all are in the same boat, on the same side.
- For all to understand that BIS' control process is open and transparent and is for establishing controls that protect (not hinder) research and innovation, as well as legitimate money-making transactions that involve emerging technologies.
- For all to understand that control proposals involve interactions with all stakeholders through NOI (notice of inquiry) or ANPRM to seek public comments from likeminded allies and partners, interagency discussions, intel communities, universities and all other emerging technology developers/stakeholders, including BIS pursuing multilateral export control regimes venues.
- For all to understand that only when and if the urgency of protecting US national security requires it, that a unilateral control may be applied (while also working to win multilateral consensus).

How can universities become involved?

- Become a member of a TAC
  - TAC Home (doc.gov)
  - Recruitment via annual *Federal Register* notice; application and ability to obtain a security clearance required
  - Membership term = (4) years
  - Quarterly meetings
- Submit comments in response to BIS proposed rules, ANPRMs, etc.

What Are TACs?

- 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.
- The TACs are composed of representatives from academia, industry and Government representing diverse points of view on the concerns of the exporting community.
- For more information: https://tac.bis.doc.gov

ET and FT Export Controls: Work in Progress

- Emerging Technology control is a work in progress
  - Technologies evolve: ETs become obsolete, new ET emerge.
  - Technology categories evolve: new ones appear, others dwindle in importance.
  - ET controls can only evolve with evolving technologies.
- Emerging Technology control is and must be collaborative and inclusive
  - Internationally, working with allies and partners and through multilateral export control regimes.
  - Nationally, working through interagency process.
- Exchanges and sharing in conference's and seminar's platforms like this one feed into this work in progress.

Conclusion

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

Thank You

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