Revised 10-17-14

Interagency Agreement (IA) Between DHS Science & Technology Directorate and the DOE Sandia National Laboratory

[IA Number HSHQPM-17-X-00141]

Statement of Work (SOW)

1. **Introduction**
2. **Purpose**

This Statement of Work (SOW) provides specific information regarding the requirements of the Department of Homeland Security, Science and Technology Directorate, hereinafter referred to as DHS S&T, sufficient to enable the Department of Energy *Sandia National Laboratory*, hereinafter referred to as DOE, to perform services under an interagency agreement.

1. **Authority**

Section 309(a)(1)(c) of the Homeland Security Act of 2002 (Public Law 107-296) provides special access to the DOE national laboratories and other facilities on a reimbursable basis as implemented in DOE Order 484.1 “Reimbursable Work for the Department of Homeland Security”.

1. **General Terms & Conditions**

Activities undertaken pursuant to this document are subject to the Standard Terms and Conditions hereby attached between the DHS S&T and DOE.

1. **Project Title**

*Open Threat Assessment Platform Development Acceleration*

1. **Description of Products or Services / Bona Fide Need**

The performer shall use the funding provided to develop the Open Threat Assessment Platform, an open architecture standard for Advanced Imaging Technology (AIT) person scanning software as well as Computed Tomography (CT) software.

1. Background

To ensure the freedom of movement for people and commerce, the Transportation Security Administration (TSA) provides effective security screening for millions of passengers, millions of pieces of baggage, and millions of shipments of cargo on thousands of flights across the nation every day. Under its current mode of operation, the TSA faces challenges that result from requirements that directly compete with each other:

• Improve security by providing accurate screening

• Improve operational efficiency by screening a large and fluctuating volume of passengers and items as quickly as possible

• Ensure a positive passenger experience by protecting individuals’ rights and privacy and easing their journey through security

• Ensure fiscal prudence by successfully meeting all requirements with limited resources

To solve this dilemma, the Transportation Security Strategic Capability Investment Plan[[1]](#footnote-1) developed by TSA’s former Office of Security Capabilities (OSC) [now the Office of Requirements and Capabilities Analysis (ORCA)] highlights the mission need for flexible and dynamic risk-based threat detection capabilities that can integrate diverse data sources in near real–time and adapt screening commensurate with each passenger’s risk. Such a capability has the potential to reshape TSA’s mode of operation and help improve security, operational efficiency, passenger experience, and cost efficiency. Further, as stated in the Plan, “No single capability or investment will enable TSA to accomplish its intelligence driven, risk-based transformation to a high performing counterterrorism organization.” Therefore, it is vital for TSA to overcome the technology and market barriers that currently inhibit participation in the innovation process.

Underpinning this challenge (lack of dynamic threat detection) is the fact that current systems are highly complex and proprietary with little data, image, or interface standardization. This means that ORCA must depend solely on the equipment manufacturer and existing contracting mechanisms for software, algorithm, component or operational upgrades. This limitation prevents ORCA from engaging new and innovative partners to solve problems and can slow response to the emerging needs.

DHS S&T initiated the Apex Screening at Speed (Apex SaS) program to address current and future challenges to aviation security. The Apex SaS Program is pursuing transformative R&D activities that support a future vision for increasing security effectiveness while dramatically reducing wait times and improving the passenger experience. To achieve this vision, open architectures and third party software are critical to implementing risk-based screening and responding to evolving threat environments. Building the framework for open platforms early in the research and development cycle of millimeter wave person screening and computed tomography x-ray carry-on systems allows for software development to begin earlier and lower costs to end-users.

To help DHS S&T and TSA meet this challenge, Sandia National Laboratories and its industry partners intend to build the foundations for an open technology platform. An “open” platform is defined as a technology platform that utilizes a “plug-and-play” or open architecture based on standardization of data formats, interfaces, and protocols that allow for the modularization of security capabilities. The goal of the project, the ***Open Threat Assessment Platform (OTAP)***, is to develop and demonstrate open architecture prototypes that allow third-party vendors to develop and easily implement new security capabilities for field deployable screening technology. An open architecture can be described as enabling a plug-and-play system not unlike third-party apps developed for smart-phones and will allow third-party vendors to easily develop and implement capability upgrades because they can utilize a stable, well-designed interface implemented on screening technology. While the technology that enables OTAP to be an open architecture will be non-proprietary or freely shared, third-party applications (hardware or software) could be proprietary or non-proprietary to ensure market rewards for innovation for different technology business models.

A core product from the OTAP project is the Open Platform Software Library (OPSL). OPSL consists of a set of open, commonly available, and standardized data interfaces[[2]](#footnote-2), exchanges, and formats. OPSL will serve as an interface to enable engineering of third-party software components (e.g., threat recognition algorithm) or hardware components for their seamless integration into a passenger screening systems. The intent of OPSL is to be the software foundation of an open platform as described above.

The purpose of this action is to establish an IA with DOE for the tasking described in Section III of this Statement of Work (SOW).

1. **Scope**

DHS S&T is has a variety of projects supporting the development of next-generation aviation security capabilities as part of its APEX Screening-at-Speed program. Several of those efforts will utilize an open architecture and allow integration with 3rd-party party capabilities. DHS S&T is seeking the following from Sandia’ OTAP project to further its APEX program:

1. Further Development of OPSL to support AIT modularization to include third-party algorithms supporting threat detection (including ATR Reconstruction algorithms).

2. Development of a standardized data format to structure data from AIT scans. The intent of the formatting effort is to ensure that third-parties have a standardized, non-proprietary way to access all levels of data from AIT scans as opposed to being limited to post-reconstruction, proprietary data.

a. (Optional) Accelerate the development of an “A’-A’” data format for CT machines to enable greater access to pre-reconstruction data. The technical lessons learned and progress from the CT effort already underway with the OTAP project will directly inform and facilitate the AIT data format effort.

3. Support further development of the MRAD algorithm development environment to support rapid test and evaluation (T&E) of AIT ATR algorithms.

a. (Optional) Accelerate the development of third-party CT ATR and Reconstruction algorithms on the OTAP program to mature the ATR development and T&E of AIT algorithms.

*TASK(s):*

1. **Project Management**: The performer shall implement basic project management actions such as planning, status reports, briefings, and meetings. In addition to basic project management, the performer shall complete the following sub-tasks:
   1. Create a plan upon receipt of funding and interaction with AIT developers detailing specific milestones for each major task (see below). The plan should realistically account for the times/resources available to both the AIT developers, the performer’s team, and the hard deadline needs of S&T’s programs as well as technical risk.
2. **Develop OPSL Software for AIT**: The performer shall develop the OPSL software for AIT to modularize the AIT system such that, at a minimum, third-party algorithms such as reconstruction, ATR, and data correction/calibration algorithms can be easily incorporated onto an AIT platform. The minimum viable product (MVP) for this task shall be a demonstration using OPSL and a demo-ATR that can be executed on a working AIT. Sub-tasks include the following:
   1. Working directly with national laboratories, OEMs, and other organizations to understand the engineering architecture of the AIT machines of interest.
   2. Writing the OPSL code that will enable third-party algorithms to be easily incorporated with AITs as has been done with Advanced Technology and Computed Technology X-ray machines. The OPSL code should be implementable on a stand-alone machine apart from the AIT CPU (adapter mode) and implementable via an SDK that allows OEMs to directly add OPSL code to their code base.
   3. Executing a demonstration of the MVP. In pursuit of the MVP, the performer shall put together a plan of milestones incrementally leading up to the MVP. The intent is that if any one of the milestones appears to be too difficult or expensive, DHS S&T may choose to discontinue the work. DHS S&T will either provide a sample ATR or will task the performer with creating one. If the latter is the case, then S&T shall provide sufficient data to accomplish that goal.
   4. Packaging the OPSL code to include i) the Open Platform Software Library (OPSL) Standard Development Kit (SDK), ii) documentation on how to install and utilize the SDK, iii) OPSL API documentation, and iv) example code for use by OEMs.
3. **Develop a standardized data format to structure “raw” data from AIT scans**: The performer shall develop and validate a draft specification to format the “raw” data coming directly off of the AIT detectors. The MVP for this task will be a very basic reconstruction algorithm or ATR produced either by the performer or a third-party that successfully utilizes the data format. The reconstruction algorithm or ATR must simply be able to utilize the data. Sub-tasks include the following:
   1. Working directly with national laboratories, OEMs, and other organizations to understand the engineering architecture of the AIT machines of interest.
   2. Development of a draft specification which characterizes the necessary aspects of the AIT system to allow for a useful formatting raw data.
   3. Development of an SDK that allows a developer to implement the format on an actual AIT.
   4. Development of or partnering with a third-party to develop an algorithm that utilizes the formatted data.
   5. Executing a demonstration of the MVP. In pursuit of the MVP, the performer shall put together a plan of milestones incrementally leading up to the MVP. The intent is that if any one of the milestones appears to be too difficult or expensive, DHS S&T may choose to discontinue the work.
   6. Packaging the formatting code to include i) the format SDK, ii) documentation on how to install and utilize the SDK, iii) format API documentation, and iv) example code for use by OEMs.
4. **Support further development of the OTAP MRAD[[3]](#footnote-3) algorithm development environment:** In order to support rapid T&E of AIT ATR algorithms the performer shall augment the MRAD capability to be able to execute AIT ATRs and score them using, at a minimum, traditional ROC curve metrics.
   1. Obtain or create a database of AIT images provided by DHS/S&T. The primary intent of the database is to provide a test dataset against which the ATRs will be validated. The database should be searchable across different scan features and should be transferable to third-party performers for ATR training if necessary. Sandia, if determined necessary, must receive a determination from its Institutional Review Board with respect to human subject research compliance prior to receipt of AIT images.
   2. Augment MRAD to be able to execute partner ATR vendors’ algorithms. Additional code development should include ii) basic documentation explaining how vendors should configure their ATR code to be executed by MRAD and ii) documentation allowing a delegate of DHS S&T to run basic functions of the MRAD capability.
   3. Demonstration of MRAD.
5. **Accelerate the development of an “A’-A’” data format for CT machines**: The performer shall accelerate development of a format for CT raw data to enable ease of access to pre-reconstruction data by third-party performers. The technical lessons learned and progress from the CT effort already underway with the OTAP project will directly inform and facilitate the AIT data format effort. Specifically, the performer shall implement or modify the implementation of an A’-A’ format on a CT machine using an SDK and attempt to develop either a reconstruction or ATR from the formatted data. As needed, the performer shall adapt the SDK to ensure useful A’-A’ outputs. The performer will then develop a short report with recommendations for the evolution and use of the SDK. The performer may opt to use typical or multi-energy detectors as part of the effort.
6. **Accelerate the development of third-party CT ATR and Reconstruction algorithms**: The performer shall accelerate and mature the ATR development and T&E of CT ATR and reconstruction algorithms by third-party performers. The technical lessons learned and progress from the CT effort already underway with the OTAP project will directly inform and facilitate the AIT data format effort. Specifically, the performer will work with at least one third-party algorithm developer to develop a demo CT ATR covering at least one explosive or weapon with the available CT data. The performer will develop a short report with recommendations and lessons learned from the effort.
7. **Systems Engineering Analysis**: The performer shall, at the direction of DHS/S&T, perform specific analyses and studies of technical and operational challenges related to the development of an open architecture for aviation security screening.

1. Key Milestones and Deliverables

Please refer to the Software Deliverables document for guidance requirements for the development of software for DHS S&T.

*Table 1*

| **Task Number and Name** | **Milestones/Deliverables** | **Due Date or Completion Date** |
| --- | --- | --- |
| 1.0 Project Management **(F)** | 1. Kickoff  2. Program Summary Sheet, and Non-Proprietary Quad Chart  3. Monthly Technical Status Report (MSR)  4. Invoice & Financial Status Report  5. Monthly Teleconference  6. Milestones Plan  7. Final Report | 1. 30 days after award  2. 30 days after award  3. 15th calendar day of the month  4. 15th calendar day of the month  5. 5 working days after delivery of MSR  6. 6 weeks after award  7. 17.5 months after award |
| 2.0 Develop OPSL Software for AIT **(F)** | 1. OPSL-AIT Draft Requirements Document  2. OPSL-AIT API  3. OPSL-AIT Demo  4. OPSL-AIT Code Package for Distribution  5. Other source code developed under this task | 1. 4 months after award  2. 12 months after award  3. 18 months after award  4. 18 months after award  5. 18 months after award |
| 3.0 Develop a standardized data format to structure “raw” data from AIT scans **(F)** | 1. Quick Look Report from meetings with manufacturers  2. Draft specification document  3. SDK code package with documentation and example code  4. ATR that uses the data format  5. Demonstration of ATR on an AIT using the data format  6. Code package with final SDK, documentation, user guide, and example code | 1. 3 months after award  2. 6 months after award  3. 8 months after award  4. 12 months after award  5. 16 months after award  6. 18 months after award |
| 4.0 Support further development of the OTAP MRAD algorithm development environment **(F)** | 1. MRAD demo that shows execution of ATR using scans provided by the scan DB  2. Final MRAD demonstration  3. Final MRAD source code | 1. 12 months after award  2. 16 months after award  3. 18 months after award |
| 4.1 Develop AIT Dataset **(F)** | 1. Training and testing dataset of ground-truth AIT scans | 6 months after funding |
| 5.0 Accelerate the development of an “A’-A’” data format for CT machines **(F)** | 1. Demonstration of a basic working ATR or reconstruction from A’-A’ data  2. Lessons learned report | 1. 6 months after award  2. 6 months after award |
| 6.0 Accelerate the development of 3rd –party CT ATR and Reconstruction Algorithms **(F)** | 1. Demonstration of a basic working ATR or reconstruction dealing with either 1 explosive or 1 prohibited item  2. Lessons learned report | 1. 6 months after award  2. 6 months after award |
| 7.0 Systems Engineering Analysis **(F)** | 1. Final Report | 1. 17.5 months after award |

V. Project Timeline

Below is a summary of the tasking timeline for this effort:

*Table 2*

|  | **Month Deliverable is due after Award or Services are to be completed** | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 1.0 Project Management | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2.0 Develop OPSL Software for AIT |  |  |  | X |  |  |  |  |  |  |  | X |  |  |  |  |  | X |
| 3.0 Develop a standardized data format to structure “raw” data from AIT scans |  |  | X |  |  | X |  | X |  |  |  | X |  |  |  | X |  | X |
| 4.0 Support further development of the OTAP MRAD algorithm development environment |  |  |  |  |  | X |  | X |  |  |  | X |  |  |  | X |  | X |
| 5.0 Accelerate the development of an “A’-A’” data format for CT machines |  |  |  |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 6.0 Accelerate the development of 3rd-party CT ATR and reconstruction algorithms |  |  |  |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |
| 7.0 Systems Engineering Analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | X |

**VI. Other IA Details**

1. Period of Performance. The period of performance (POP) for this SOW is from the effective date of the IA through eighteen (18) months.
2. Travel. Travel may be required in the performance of the duties listed herein. Travel may include, but not be limited to CONUS.

Foreign travel shall require the DOE facility management contractor to obtain the DHS S&T Technical Representative’s approval and an approved DHS S&T Foreign Travel Report 30 days in advance of the travel. Foreign travel will be consistent with DOE Order 551C.

1. **DHS-Furnished Information and Property.**

DHS furnished information and property, if any, shall be provided in a numbered attachment to this SOW and listed in Section VIII, Applicable Documents. Upon completion of this IAA, the property will be disposed of consistent with the guidance provided by, or advice of, the DHS Contracting Officer.

1. **Property Acquired by the Servicing Agency Under This Interagency Agreement.**

Any item(s) of property in excess of $5000 in value if any, acquired by the Servicing Agency or its facility management contractor under this interagency agreement, shall be identified in a numbered attachment to this SOW and listed in Section VIII, Applicable Documents.

1. **Place(s) of Performance.** *DOE* will perform the work under this SOW at *Livermore, CA* and at other sites as determined by the DHS S&T COR.
2. **Program Status Report.** DOEshall deliver a monthly status report, in accordance with Section 10.a. of the attached Standard Terms and Conditions, due within ten **(**10) business days of the end of each month.
3. **Deliverables**. DOE will provide all deliverables identified in this SOW to the Government in accordance with Section 10.b. of the attached Standard Terms and Conditions.
4. **Invoices.**  DOE will deliver a monthly invoice to [ST.Invoicing@hq.dhs.gov](mailto:ST.Invoicing@hq.dhs.gov),

consistent with DOE budget guidance and the monthly invoice schedule of the DOE

facility management contractor.

1. **Security Requirements.** The terms and conditions of Section14 of the attached Standard Terms and Conditions shall govern “Security” under this IA. All work performed under this SOW is unclassified unless otherwise noted below.

If provided DHS “sensitive” information (e.g., items marked with FOUO or other appropriate marking), the Servicing Agency agrees it shall safeguard such information by not providing access of this marked information to any non-federal personnel unless advance approval is obtained from the DHS/S&T Technical Representative.  In turn, the DHS/S&T Technical Representative must ensure any applicable DHS security and/or suitability requirements are satisfied by its servicing DHS Security office and that a DHS NDA Form 11000-6s are signed by the non-federal personnel before access to DHS “sensitive” information is given to them.  The DHS/S&T Technical Representative must further obtain copies of the executed, signed DHS Form 11000-6s, to be provided to the DHS Contracting Officer (for inclusion in the official DHS/OPO inter-agency agreement file).

Sandia will potentially need access to Secret information. This information will be related to threat detection requirements and threat information. DHS will provide this information to Sandia for their use and storage for the duration of the project. Upon completion of the project, all classified materials will be returned or destroyed.

1. **Funding Requirements**. DHS S&T will provide funding to the Sandia in accordance with DHS’s appropriations and available funds. Task 4.1 “Develop AIT Dataset” is unfunded at this time. Funding is according to the IGCE as specified in **Error! Reference source not found.**.

*Table 3*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Project Task\*\*\*** | **Total Funding** | **Labor** | **Material** | **Subcontracts** | **Travel** |
| **1       Project Management** | **$45,000.00** | **$40,000.00** | **$0.00** | **$0.00** | **$5,000.00** |
| **2       OPSL AIT Software** | **$333,000.00** | **$60,000.00** | **$7,500.00** | **$242,000.00** | **$23,500.00** |
| 2.1     AIT Architecture/Industry Exploration | **$40,500.00** | $15,000.00 | $0.00 | $17,000.00 | $8,500.00 |
| 2.2     OPSL AIT Code Writing | **$145,000.00** | $25,000.00 | $0.00 | $120,000.00 |  |
| 2.3     OPSL AIT MVP Demo | **$102,500.00** | $15,000.00 | $7,500.00 | $65,000.00 | $15,000.00 |
| 2.4     Package OPSL AIT | **$45,000.00** | $5,000.00 | $0.00 | $40,000.00 |  |
| **3       Standardized AIT Raw Data Format** | **$291,500.00** | **$145,000.00** | **$13,500.00** | **$113,000.00** | **$20,000.00** |
| 3.1     AIT Architecture/Industry Exploration | **$75,000.00** | $45,000.00 | $0.00 | $20,000.00 | $10,000.00 |
| 3.2     Draft Specification | **$28,000.00** | $20,000.00 | $0.00 | $8,000.00 | $0.00 |
| 3.3     SDK | **$83,500.00** | $30,000.00 | $3,500.00 | $50,000.00 | $0.00 |
| 3.4     MVP Demo | **$70,000.00** | $40,000.00 | $10,000.00 | $10,000.00 | $10,000.00 |
| 3.5     Package SDK | **$35,000.00** | $10,000.00 | $0.00 | $25,000.00 | $0.00 |
| **4       MRAD Development** | **$210,000.00** | **$190,000.00** | **$11,500.00** | **$0.00** | **$8,500.00** |
| 4.1     Create/Integrate AIT Database | **$65,000.00** | $60,000.00 | $5,000.00 | $0.00 | $0.00 |
| 4.2     Augment MRAD to execute AIT algorithms against an AIT dataset | **$100,000.00** | $90,000.00 | $5,000.00 | $0.00 | $5,000.00 |
| 4.3     MRAD Demo | **$45,000.00** | $40,000.00 | $1,500.00 | $0.00 | $3,500.00 |
| **5 Accelerate A'-A' for CT (Integrate 3rd Party Detectors with Lab Grade CT)** | **$260,000.00** | **$200,000.00** | **$60,000.00** | **$0.00** | **$0.00** |
| **6 Accelerate ATR/Reconstruction for CT** | **$280,000.00** | **$100,000.00** | **$0.00** | **$180,000.00** | **$0.00** |
| **7 Systems Engineering Exploration & Analysis** | **$167,748.00** | **$135,000.00** | **$0.00** | **$25,248.00** | **$7,500.00** |
| **Total** | **$1,587,248.00** | **$1,150,000.00** | **$122,500.00** | **$560,248.00** | **$67,500.00** |

*\*Describe specific costs included in this column.*

\*\*The DOE National Laboratory’s/Site’s Directed Research and Development (LDRD) cost as defined in Section 4.d. of the Standard Terms and Conditions is included in the total funding amount specified above.

\*\*\* If the funding described in this table includes an item or items of Contractor Acquired Property with a value in excess of $5000 but below the threshold, agreed to by DOE and its facility management Contractor/M&O in their current negotiated contract, for the purposes of maintaining accountability procedures, such item or item(s) shall be specifically identified in accordance with Section VI.4. of this SOW. Such item/items may or may not at the discretion of DHS be tagged, tracked, reported on, and disposed of as DHS property in the same manner as Contractor acquired property in excess of the value established under the aforementioned contract for maintaining accountability procedures, in accordance with Articles 8 and 9 of the Standard Terms and Conditions of this IA. The Servicing Agency shall include in its proposal to DHS S&T for this IA the reasonable, allowable and allocable costs of maintaining accountability of such item(s) in accordance with the aforementioned procedures.

* + 1. Points of Contact

Sandia National Laboratory Points of Contact (POCs) (name, mailing address, office phone number, and email address) are as follows:

**Technical POC –**Andrew Cox  
Sandia National Labs

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Angela Hsu

Sandia National Labs

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Phone: (925) 294-3776

Email: ahsu@sandia.gov

The DHS POCs are as follows:

**DHS S&T COR**

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Explosives Division

Science and Technology Directorate

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Email: [Mingming.Yu@hq.dhs.gov](mailto:Mingming.Yu@hq.dhs.gov)

**DHS S&T Invoicing**

DHS ICE

Attn: S&T EXD Invoice

Dallas Finance Payment Address 1605 LBJ HWY

Suite 300

Farmers Branch, TX 75234 Email: [ST.Invoicing@hq.dhs.gov](mailto:ST.Invoicing@hq.dhs.gov)

* + 1. Applicable Documents

Attachment: Software Deliverables Document

* + 1. Changes to this SOW

Changes to this SOW shall be in made in accordance with Section 2.b. of the attached Standard Terms and Conditions.

1. Transportation Security Strategic Capability Investment Plan, Office of Security Capabilities, May 2014, https://www.fbo.gov/index?s=opportunity&mode=form&id=bcdf2fca93b27daf4a6a399297c25dc7&tab=core&\_cview=0 [↑](#footnote-ref-1)
2. The term used in the software world is Application Programming Interface (API). “In computer programming, an application programming interface (API) is a set of routines, protocols, and tools for building software applications. An API expresses a software component in terms of its operations, inputs, outputs, and underlying types. An API defines functionalities that are independent of their respective implementations, which allows definitions and implementations to vary without compromising each other. A good API makes it easier to develop a program by providing all the building blocks. A programmer then puts the blocks together.” <http://en.wikipedia.org/wiki/Application_programming_interface> [↑](#footnote-ref-2)
3. **M**eans for **R**apid **A**lgorithm **D**evelopment [↑](#footnote-ref-3)