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Feasibility Study of a Interlaboratory Exchange Program for Safeguards Professional Development

S. Pepper,

October 2017

Nonproliferation and National Security Department
Brookhaven National Laboratory

U.S. Department of Energy
USDOE National Nuclear Security Administration (NNSA), Office of Defense Nuclear Nonproliferation (NA-20)

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Nonproliferation and National Security Department
Safeguards Policy and Implementation Group

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Table of Contents

List of Figures

List of Tables

Executive Summary

In FY2017, the National Nuclear Security Administration's Office of Defense Nuclear Nonproliferation Office of International Nuclear Safeguards (NA-241) assigned Brookhaven National Laboratory's (BNL's) Nonproliferation and National Security Department to investigate the feasibility of interlaboratory exchanges to promote the sharing of specialized skills and expertise across the lab complex and to provide opportunities for safeguards professionals to access facilities and activities not locally available. Such exchanges would give safeguards professionals who work at laboratories without operating nuclear facilities the opportunity to get hands-on experience with the management of such facilities or handling of nuclear material. Other laboratory professionals could get the opportunity to contribute to policy analysis. As originally envisioned, an interlaboratory exchange program would enable selected safeguards professionals in the national laboratory network to work at another national laboratory for a period of two weeks to six months to offer their expertise and gain experience in programs to which they would not otherwise be exposed.

BNL's project was part of a larger collaboration between BNL, Oak Ridge National Laboratory (ORNL), Savannah River National Laboratory (SRNL), and the Y-12 National Security Site (Y-12). ORNL and Y-12 conducted a pilot exchange for one mid-career and one early employee. SNRL was charged with investigating the possibility of an exchange between SRNL and the Westinghouse Fuel Fabrication Facility (WFFF).

BNL gathered information for this study by interviewing BNL legal and human resources representatives, interviewing safeguards managers from other laboratories and conducting a survey of prospective laboratory exchange candidates. BNL also identified other similar exchanges and estimated the cost of interlaboratory exchanges based on BNL labor rates and GSA-approved per diem rates in effect in FY2017.

There was an overwhelmingly positive response from the laboratory managers that BNL interviewed as well as the respondents to BNL's survey. All thought an interlaboratory exchange is a good idea and that it would have a positive impact on the careers of early and mid-career safeguards professionals. The advantages to exchanges include increased personal experience for the exchangee as well as the collective experience within the safeguards community, assistance to the U.S. government in creating a pool of well-qualified candidates for positions in the IAEA Department of Safeguards, knowledge management, replacement of retiring staff, cross training and training of young professionals.

While it was originally envisioned that laboratory personnel would undertake simultaneous exchanges at complementary laboratories, BNL realized during the study that it is not practical or necessary for the exchanges to be concurrent.

Financial sponsorship is perhaps that biggest obstacle to conducting exchanges. The expected cost of an exchange is significant and will include both quantitative (those related to labor and travel), and qualitative costs (those associated with disruption of normal work schedules and processes). NA-241 is the most likely source of funding. However, one successful exchange could have a large return on investment. NA-241 should not discount the value of exchanges because they are expensive and will not be routine. Other administrative hurdles, such as labor, human resources, or liability considerations, are expected to be insurmountable. DOE national laboratories have similar policies and protections that cover their work at other sites. Managers indicated that exchanges with private sector entities would be of value, but that they would be more difficult to arrange due to different organizational policies and procedures. An anticipated administrative difficulty is that training is rarely transferable to other laboratories. Exchangees will likely spend significant time repeating training that they have already taken at their home laboratory. Poaching was listed as a realistic disadvantage of exchanges. Some managers consider poaching this a natural result of collaboration, while others viewed it in a very negative light.

Managers and prospective exchangees differ in their opinions of the optimal length of the assignment. Most managers believe that a longer (3-6 month) assignment would be optimal for the exchangee to become embedded and fully functional at the host facility. Many prospective exchangees have spouses and young children and in their responses to the survey, many expressed concerns about being away from their families for an extended period.

Managers recommended that the home and host laboratories have a memorandum of agreement (MOA) to document the terms and conditions for the exchange. The MOA should include a detailed scope of work for the assignment and should address the requirements for security, training, medical insurance and intellectual property (IP) that is created during the exchange. A nondisclosure agreement may be necessary to protect the pre-existing IP of the stakeholders.

List of Acronyms

BNL	Brookhaven National Laboratory
CFE	Cost Free Expert
DOE	U.S. Department of Energy
IAEA	International Atomic Energy Agency
JPO	Junior Professional Officer
IP	Intellectual Property
IPA	Intergovernmental Personnel Act (Agreement)
M&IE	Meals and Incidental Expenses
M&O	Management and Operating (Contractor)
MOA	Memorandum of Agreement
NA-241	National Nuclear Security Administration's Office of Defense Nuclear Nonproliferation Office of International Nuclear Safeguards
NNSA	National Nuclear Security Administration
ORNL	Oak Ridge National Laboratory
SRNL	Savannah River National Laboratory
Y-12	Y-12 National Security Site
USSP	U.S. Support Program to IAEA Safeguards
WFFF	Westinghouse Fuel Fabrication Facility

Introduction

In FY2017, the National Nuclear Security Administration's Office of Defense Nuclear Nonproliferation Office of International Nuclear Safeguards (NA-241) assigned Brookhaven National Laboratory's (BNL's) Nonproliferation and National Security Department to investigate the feasibility of interlaboratory exchanges to promote the sharing of specialized skills and expertise across the lab complex and to provide opportunities for safeguards professionals to access facilities and activities not locally available. Such exchanges would give safeguards professionals who work at laboratories without operating nuclear facilities the opportunity to get hands-on experience with the management of such facilities or handling of nuclear material. Other laboratory professionals do not get the opportunity to contribute to policy analysis. As originally envisioned, an interlaboratory exchange program would enable selected safeguards professionals in the national laboratory network to work at another national laboratory for three to six months to offer their expertise and gain experience in programs to which they would not otherwise be exposed.

BNL's project was part of a larger collaboration between BNL, Oak Ridge National Laboratory (ORNL), Savannah River National Laboratory (SRNL), and the Y-12 National Security Site (Y-12). ORNL and Y-12 conducted a pilot exchange for one mid-career and one early employee. SNRL was charged with investigating the possibility of an exchange between SRNL and the Westinghouse Fuel Fabrication Facility (WFFF).

This report documents the results of BNL's feasibility study.

Terms

The following terms are used in the report as defined below:

Exchange - the assignment of an employee from one DOE national laboratory, plant or site to another DOE national laboratory, plant or site
Exchangee - individual on assignment at a laboratory other than their employer
Home laboratory - the exchangee's employer
Host laboratory - the laboratory to which the exchangee is assigned
National Laboratory – one of the DOE network of laboratories, plants and sites.

Scope and Methods

To gather information from the international safeguards community, the project team conducted interviews with national laboratory managers and prepared and distributed a survey to prospective candidates for interlaboratory exchanges. The interview questions are provided in Appendix 1. The interview questions covered

experience with professional exchanges, support of the concept of interlaboratory exchanges, human resources and legal policies that would affect interlaboratory exchanges, and logistics required for successful interlaboratory exchanges. The project team interviewed managers from Oak Ridge, Los Alamos, Lawrence Livermore, and Savannah River National Laboratories and Y-12. The results of the interviews are presented in Interview Results.

The survey questions are provided in Appendix 2. The survey was conducted using NoviSurvey, an on-line survey application hosted by BNL. The survey collected information regarding the respondents' background, positions, experience level and knowledge of national laboratory capabilities and assessed their interest in developing their careers through interlaboratory exchanges, their preferences for the format and timing of exchanges, and the experience the respondents' believe they are lacking. The survey was distributed to 37 safeguards professionals identified by the project team and survey respondents as being good candidates for future interlaboratory exchanges. Those on the distribution were encouraged to distribute the survey to their other prospective exchanges. BNL received 29 responses to the survey. The responses came from employees of Brookhaven, Sandia, Pacific Northwest, Argonne, Oak Ridge, Lawrence Livermore, Idaho, and Los Alamos National Laboratories and 27 of the respondents indicated that they had between one and fifteen years' experience in the safeguards field. Ten respondents self-identified as being policy specialists, eleven respondents self-identified as being technical specialists and eight respondents self-identified as being specialists in both policy and technology. The survey results are discussed in detail in the section titled Survey Results.

Prior to conducting interviews and developing the survey, the research team discussed the advantages and potential obstacles to successful laboratory exchanges. We conducted internal interviews of BNL legal and human resources staff for the purposes of understanding the laboratory policies that may affect the success of interlaboratory exchanges and of identifying insurmountable obstacles that would prevent laboratory exchanges from taking place. The results of these internal interviews were used to prepare questions for the external interviews and survey.

Existing Exchanges

There are exchanges organized by various organizations to promote the professional development of their staff members and members of their industry. This section provides a description of several examples that were identified during the research for this project.

Junior Professional Officers (JPOs) – These are positions sponsored by the U.S. Support Program to IAEA Safeguards (USSP) and other Member State Support Programs to assist the IAEA Department of Safeguards with basic, yet essential

work. The United States also sponsors JPO positions in other Departments of the IAEA. JPOs work with the IAEA for one or two years at the P1 or P2 professional level[1] and they receive all the benefits and privileges of IAEA regular staff. JPOs work alongside more senior IAEA staff members and cost free experts (CFEs) to free them to address more complex tasks. Additional objectives of the JPO program are to provide opportunities for early career professionals in the nuclear field and introduce the next generation to international civil service, in general, and the IAEA Department of Safeguards, in particular. The JPO program has been shown to be an excellent springboard into other types of IAEA positions and positions at national laboratories and in the U.S. government.[2] CFE[3] assignments and IAEA regular staff[4] assignments have similar benefits. The USSP has sponsored about 30 JPO positions in the IAEA Department of Safeguards since the inception of the program in 2006.

DOE Leadership Development Rotation Program – This program for Department of Energy (DOE) federal employees began in Fall 2016 and provides opportunities to work at DOE national laboratories, plants and sites to gain experience. The purpose of the program is to strengthen collaboration between DOE Headquarters and site offices, create career development opportunities and create additional diversity in the workforce, and break down stovepipes and enhance mission effectiveness. The initial program offered 22 positions with durations ranging from 90 to 180 days. The positions have varying requirements for education and experience and some require a Q clearance. The costs of the assignment are borne by the exchangee's home office.

SRNL Rotation Program – SRNL has a rotation program that enables staff to work in its production areas. The program has assignments with durations of 6 to 24 months and individuals are assigned to specific projects.

Duty Travel to other Laboratory Sites – Many national laboratory scientists and engineers collaborate with counterparts from other laboratories during their careers because their projects require meetings or experiments to be conducted at other locations. This travel, while usually limited to one to two weeks in duration, provides the opportunity for networking with employees from other facilities, familiarization with the capabilities found at other facilities, and learning new skills. This travel is understood by the sponsor to be part of the funded work.

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[1] The P1 and P2 professional grades require a college degree and 0-2 years' work experience.

[2] S. Pepper, J. Carbonaro, B. Hoffheins, and T. Collins, "Career Progression of Junior Professional Officers," poster presented at the 56th Annual Meeting of the Institute of Nuclear Materials Management, Indian Wells, CA, July 2015.

[3] Cost Free Experts are sponsored by the U.S. Support Program to IAEA Safeguards or another Member State Support Program. They work with the IAEA for a period of 2-5 years at the P3, P4, or P5 professional levels, requiring 5, 7, or 10 years' experience, respectively.

[4] IAEA regular staff positions are advertised by the IAEA on its website (www.iaea.org) and are supported through the IAEA's regular budget.

Intergovernmental Personnel Act Assignments (IPAs) and Management and Operating Contractor Assignments (M&Os) at DOE Headquarters and other federal agencies – There are opportunities in DOE and NNSA for national laboratory employees to work alongside federal employees in IPA and M&O assignments. These assignments typically last one to three years, provide the DOE office with manpower and expertise that they lack, and provide the exchangee the opportunity to learn how agencies of the U.S. government conduct their business. DOE provides funding to the home laboratory to cover the costs of labor and travel associated with the assignment. Because the duration is over 30 days, the extended travel rules apply.

Rotations – Some employers offer an opportunity to work in one of more position within the organization before settling into a position for the long term. At one time, Los Alamos offered the opportunity for some of its staff members to work in their Rocky Flats office. At the beginning of the U.S. Voluntary Offer, LANL provided staff members to support inspections at Y-12 and Hanford. The Department of Energy and the Nuclear Regulatory Commission have programs that allow new staff members to rotate through several offices. SRNL allows staff members to work in other departments for extended periods of time. The authors interviewed several people in the safeguards community who had the opportunity to rotate within their organization, and they reported that the experience was valuable.

Complementary Projects

NA-241 also commissioned projects at SRNL, ORNL and Y-12 related to interlaboratory exchanges. SRNL was commissioned to explore an exchange between SRNL and WFFF. ORNL and Y-12 were commissioned to conduct a pilot exchange. This section documents their experiences.

Savannah River National Lab and Westinghouse Fuel Fabrication Facility:

SRNL was funded by NA-241 to investigate the feasibility of an exchange with WFFF. To complete their task, SRNL discussed a potential exchange with their internal support organizations (legal, personnel, etc.), representatives of WFFF, and the NNSA program manager. Contracts representatives at SRNL did not identify any obstacles to successfully conducting an exchange. They likened the concept to a visiting scientist. If WFFF required compensation to host an individual from SRNL, they would set up a contract for it. The contract would address the scope of work, and safety considerations and include a nondisclosure agreement. The contract would require the approval of DOE-SRNL and a letter of endorsement from NNSA. While SRNL is interested in placing a staff member at WFFF, they do not believe that WFFF has an interest in placing someone at SRNL. SRNL identified time and funding to be the greatest challenges to an exchange; it could take six months or more to place a contract with WFFF, and a sponsor would have to be identified to cover the labor costs.

An exchange between SRNL and WFFF might be considered a regional exchange because both organizations are located in the same state. But SRNL pointed out that the two organizations are about 70 miles apart, a distance that would be difficult and possibly unsafe to drive twice a day for an extended period.

Oak Ridge National Laboratory and Y-12 National Security Site:

NA-241 funded ORNL and Y-12 to conduct a staff exchange in FY17 using carryover funds from FY16. The ORNL exchangee had the opportunity to gain facility experience by taking measurements at Y-12; the Y-12 exchangee was able to gain additional research experience at a national laboratory. Angela Lousteau, from the Safeguards and Security Technology Group at ORNL performed measurements with the MC&A group at Y-12 in August. Commie Byrum from Y-12's NMC&A group began working with ORNL's Technical Testing and Analysis Center (TTAC) in the spring of FY17. Generally, there were few obstacles, but the exchangees had to repeat training courses that were required to work on the respective sites, as the training did not transfer between the two sites. The ORNL exchangee also obtained HRP status to avoid additional escort requirements while on-site at Y-12 and was required to have Q-clearance to work in the determined areas at Y-12. Because the two facilities are in close proximity to each other, there were no significant logistical issues involving travel or housing, but the ORNL assignment was shortened when the testing in which the exchangee participated ended earlier than expected due to a change in scope. The exchangees' schedules varied, partially because Y-12 works on a 4-10 schedule (four ten-hour days Monday through Thursday) and ORNL works generally five day weeks. Dr. Lousteau worked three days a week at Y-12, and Mr. Byrum worked one day a week at ORNL. NA-241 is continuing funding for this project to continue into FY18.

Description of Exchange Models

Laboratory exchanges can take many forms. Ideally a laboratory exchange should benefit both the home and the host laboratories. An exchange can be simultaneous or in series, where the two organizations act both as home and host. Because of personal and logistical issues, it is most likely that the exchanges would not be simultaneous, unless the two exchangees backfill each other's position. The factors that the research team considered are organizational, sponsorship, duration, location, parallel versus series assignments, assignment content, and employment status of the exchangees during the exchange.

Organizational: The research team's original focus was on assignments for DOE laboratory employees at other DOE national laboratories. This type of exchange is best suited because of the similar organizational structures of the national laboratories and their similar administrative policies. The research team learned in early FY2017 that NA-241 funded SRNL to investigate the possibility of a laboratory exchange between SRNL and WFFF. Exchanging with a private organization can

expose the exchangee to the work done outside of the DOE network, but can be constrained by the different organizational structures as well as security and intellectual property (IP) concerns.

Sponsorship: Laboratory exchanges will require funding to cover the costs of labor and travel. Funding estimates are provided in a later section. Potential sponsors and their motivations include:

Table 1: Identification of Exchange Sponsors and their Motivations

Sponsor	Motivation
Home Laboratory	to obtain capabilities in a technical area and to provide opportunities for professional development and career progression for their employees
Host laboratory	to acquire labor or expertise on a project that is understaffed (e.g., for a short term project or substitution for a staff member who is on an exchange at another laboratory)
NA-241	to develop capacity within the safeguards community; to support their own and partners' programs
U.S. Support Program to IAEA Safeguards	to develop capacity within the safeguards community and to increase awareness and understanding of the USSP and its opportunities, processes and procedures
Other U.S. government or private sector sponsor	to supplement the workforce on or add expertise to a project

Stakeholders may collaborate to cover the costs of an exchange. For the purposes of this study, the presumed sponsor is NA-241.

Duration: The options for the length of the assignment are endless, but the exchangee's personal situation, the host's interests, and the nature of the work must be addressed when considering the optimal duration. Short assignments (less than one month) will not enable exchangees to become embedded in a facility or process and obtain experience that would qualify them for future assignments. Long assignments are difficult for exchangees with families unless the sponsor provides funding for family members or the exchangee is able to cover travel costs for their family members. Our survey suggested durations of 1 week, 2 weeks, 1 month, 3 months, and 6 months.

Location: Most national laboratories are located at large distances from one another. In most cases, an interlaboratory exchange will require travel, which will affect the overall cost. However, some national laboratories, such as ORNL and the Y-12, are located closely enough to each other to enable the exchangee to remain in

his or her own home during the exchange. Such a "regional" exchange would be less costly to the sponsor and less disruptive to an exchangee with family responsibilities.

Parallel vs Series: The term exchange implies that two laboratories will allow one or more employees to work in each other's organization. It is possible but not necessary for both organizations to act as hosts. If both organizations will act as hosts, it is possible that the organizations' employees will work at the exchange location at the same time. This could be the case if the two employees are filling each other's positions. If they are not backfilling each other, it is much less likely and completely unnecessary for them to have their exchanges take place simultaneously.

Content: The content or scope of the assignment is the element that is most closely related to the objective of the exchange. Examples could include:

a. facility tours and technical skills training
b. short term collaboration and mentoring
c. facility tours and short-term residency/mentoring
d. facility tours and technical skills training
e. technical skills training & short-term residency/mentoring
f. technical skills training and medium-term residency/mentoring
g. technical skills training and medium-term residency/mentorship
h. long-term residency/mentoring

The duration of the exchange will affect what can be achieved and will necessarily affect the experience gained during the exchange. The scope for shorter duration exchanges will be limited to familiarization, whereas longer duration exchanges will enable exchangees to learn concepts and processes to the extent that they could be repeated elsewhere.

Employment status of exchangee: The project team assumed that the exchangee would remain an employee of the home laboratory and did not consider a situation in which the exchangee would become an employee of the host laboratory. The relatively short durations considered for the project (all less than or equal to six months), do not justify a change of employment.

Exchange Costs

The costs associated with exchanges are an important element affecting implementation decisions. While costs will vary from laboratory to laboratory, the research team thought it important to provide a rough estimate of the costs related to laboratory exchanges. Cost elements are exchangee's labor, exchangee's travel expenses, and host's labor and miscellaneous costs.

The options for funding exchanges are NA-241 or other external sponsorship, national laboratory funding or a combination of funding sources.

Exchangee Costs:

The following estimates are based on labor and travel for an assignment of a BNL employee at LANL. LANL is used as an example host. The travel costs, aside from airfare, would be the same for an exchangee assigned to LANL, regardless of the home laboratory. The travel costs associated with other laboratory participants would vary slightly but not significantly, depending on the airfare, local per diem rates and the burdens applied by the home laboratory. Travel costs are composed of daily accommodation, daily meals and incidental expenses (M&IE), airfare, rental car and miscellaneous expenses of $500. Accommodation and M&IE estimates take into account the rules for travel over 30 days in duration. Expenses associated with accommodation could be reduced through the use of short-term rentals rather than hotels. The labor costs will depend on the exchangee's experience and seniority and the home laboratory's labor rates. For this estimate, the research team assumed that the home laboratory (BNL) would continue to pay the exchangee.

For demonstration purposes, the authors estimated the costs associated with three different employment grades at BNL. The grades, Associate Scientist (scientific scale), Engineer II (professional scale - mid-level), and staff engineer (professional scale - entry-level), represent the employment grades of employees who are likely candidates for an exchange. Note that the travel costs are independent of the exchangee's grade.

Associate Scientists, on BNL's scientific scale, have earned a PhD in science or engineering and are responsible for the independent conduct of scientific research or creative development work (on their own or with assistance), at a level requiring a doctorate or its equivalent and at least one year's experience in research, development, or associated fields. For this estimate we used the competitive minimum salary of $116,950. The costs associated with the assignment are summarized in Table 2 below.

The typical work of an **Engineer II**, on BNL's engineering/scientific associate scale, includes definition of project goals, tasks, and resource requirements; detailed design work, resource determination, preparation of specifications and preliminary design reviews, and presentations. Work may also include building and evaluating prototypes and models, and construction and test of systems/equipment. Incumbents resolve or assist in the resolution of complex problems with design requirements and unsuitability of conventional materials and conduct independent technical investigations to formulate or modify specifications and requirements for materials, components or processes. Incumbents may evaluate vendor capabilities to provide required products or services. Engineers at this level will have earned a Bachelor's degree and may also hold a Master's degree. For this estimate, we used a

salary equivalent to the competitive minimum of $108,083. The costs associated with the assignment are summarized in Table 3 below.

Associate Staff Engineer, also on BNL's engineering/scientific associate scale, is an entry level engineer requiring a Bachelor's degree; incumbents apply standard practices and techniques in specific aspects of design, procurement, manufacture, erection, test, and initial operation. They offer solutions to a variety of technical problems of limited scope and complexity and receive close supervision on assignments and follow detailed instructions or established procedures. Their work is reviewed for completeness and accuracy. The estimate in Table 4 is based on the Competitive Minimum of $75,767.

Table 2: Costs associated with the assignment of an Associate Scientist

Cost Element	2 weeks	1 month	3 months	6 months
Total Labor (including burdens)	$15,408	$30,816	$92,449	$184,899
Total Travel (including burdens)	$5,563	$9996	$26,268	$50,525
Total Cost (including burdens)	$20,971	$40,812	$118,707	$235,424

Table 3: Costs associated with the assignment of an Engineer II

Cost Element	2 weeks	1 month	3 months	6 months
Cost of Labor (including burden)	$12,710	$25,421	$76,265	$152,531
Total Travel (including burden)	$5,563	$9996	$26,268	$50,525
Total Cost (including burden)	$18,273	$35,417	$102,533	$203,056

Table 4: Costs associated with the assignment of an Associate Staff Engineer

	2 weeks	1 month	3 months	6 months
Cost of Labor (including burden)	$12,710	$25,421	$76,265	$152,531
Total Travel (including burden)	$5,563	$9996	$26,268	$50,525
Total Cost (including burden)	$18,273	$35,417	$102,533	$203,056

Host Costs:

The host laboratory will incur some expenses related to hosting an exchangee. These costs would include labor resulting from mentoring and supporting the exchangee during the exchange and could also include supplies, equipment, and office space needed for the assignment. The authors did not attempt to estimate these costs, as they would vary widely depending on the host and the type of assignment. An exchange that involves embedding the exchangee into a project where the exchangee could be trained alongside and mentored by other project participants would be most cost effective; in such a situation, the host's costs would be indistinguishable from the costs of the project.

Interview and Survey Results

In the furtherance of this project, BNL conducted interviews and a survey to gather information from stakeholders in the national laboratories.

Interview Results:

BNL conducted interviews with safeguards managers from SRNL, LANL, LLNL, ORNL and Y-12. The objective of the interviews was to determine if there were any obstacles to conducting successful exchanges and to gauge the interest of cognizant managers in a future laboratory exchange program. The interview questions are provided in Appendix 1.

Most of the interviewees indicated that they had no experience with professional exchanges while a few participated in rotations offered by their employer or performed research at other locations. Those that had participated in some form of exchange found them to be valuable elements to their career development.

The interviewees were enthusiastic about and supportive of an exchange program. The interviews did not expose any obstacles to successful inter-laboratory exchanges that could not be overcome through pre-planning and management. The interviewees opined that the exchanges should be mutually beneficial to the host

and home laboratories and the exchangee. Specific findings from the interviews are discussed below by topical area.

Exchangee Profile – Early to mid-career individuals were thought to be the best candidates as they would have less experience with other labs than senior staff.

Assignment – When proposing the exchange, the exchangee should prepare a detailed description of the assignment so that Headquarters is assured that the assignment has safeguards relevance and so that the host laboratory can confirm that they can provide the desired experience. Some interviewees thought that the assignment should be established in the framework of an ongoing program and that gaining facility experience is a priority goal, especially for longer exchanges. The assignment should be relevant to the exchangee's intended career path.

Legal – DOE indemnifies national laboratory employees for work performed at other DOE facilities. This allows national laboratory personnel to collaborate freely across the complex, including attending meetings and conducting experiments at other sites. Therefore, the prospect of work conducted by an exchangee at a host laboratory does not raise any issues of a legal nature. For exchanges with private sector organizations, there may be some concern. SRNL is exploring the possibility of an exchange with Westinghouse. It is thought that SRNL's employee would be covered while working at Westinghouse, but it is unclear if the private sector employee would be indemnified for work performed at a national laboratory.

Human Resources – The interviewees indicated that their personnel policies and practices would be able to support the short to mid-term exchanges under consideration. It is expected that the home organization could pay their employees working at another location and that medical and other insurance would continue to be valid. Benefits such as retirement contributions and paid leave would continue to accrue. Based on the discussion related to human resources issues, BNL concludes that it would be best for the exchangee to remain on the staff of the home organization during the exchange rather than becoming an employee of the host organization. A memorandum of agreement (MOA) between the home and host organizations is advisable to document the expectations and requirements for the exchange.

> Work schedules – Alternate work schedules (AWSs) present an administrative challenge. For example, Y-12 has a 4/10 work schedule in which they typically work four ten-hour days Monday through Thursday and are off on Friday, Saturday and Sunday. In their exchange with ORNL, they had to resolve this schedule inconsistency. AWSs may require negotiation and compromise within the Human Resources elements of the host and home organizations.
>
> Compensation – The exchangee would continue to be employed by his or her home laboratory and receive the same level of compensation during the

exchange that they received immediately prior. There is no expectation that there would be a salary increase as a result of the exchange.

Health Insurance – The exchangee would continue to be covered under the home laboratory's medical insurance program. Depending on the range of the home laboratory's medical provider network, the exchangee may have to rely on out of network doctors during the exchange and this could result in increased medical expenses. However, one laboratory indicated that their network was nationwide. It was also noted that laboratory employees are not required to accept the laboratory's insurance as they may be covered under a spouse's or other plan. The host laboratory should confirm the exchangee's medical insurance coverage prior to the start of the exchange.

Tax Liability – There is no expected tax consequence related to the proposed exchanges because the duration is less than one year.

Poaching – The interviewees had varying opinions regarding the possibility that exchangees may leave their home laboratory after seeing the advantages of working at the host laboratory. Some managers thought that it is a natural part of professional development that staff members pursue new opportunities from time to time. Others would be disappointed if their employee accepted a position at the host laboratory and saw the possibility as a disadvantage of the proposed program.

Temporary Loss of Manpower – Doing without the exchangee for the period of the exchange will be a challenge for the home laboratory and when they return it may be difficult to reintegrate them to the home laboratory. For this reason, a simultaneous exchange, where two exchangees fill each other's position, would be ideal.

Education – National laboratory activities require varying levels of education; they recruit Bachelors, Masters, or PhD in a variety of fields. It is reasonable to expect that an exchange would require the same level of education that the host lab would require if hiring the individual for the desired assignment. A lower level of education would likely prevent the exchangee from obtaining any career advantage from the exchange.

Intellectual Property – This topic prompted significant discussion. One of the advantages of an exchange is learning new skills, but neither home nor host would want their unique knowledge or expertise to be openly distributed. Both the exchangee and the host organization will have IP that must be protected. Scientists and engineers that produce IP are motivated to protect it via publication and patenting, which would prevent another entity from benefitting from it. Proprietary information can also be protected through a nondisclosure agreement. Private and public participants to the exchange may have different concerns and different approaches to resolving this issue. Publications resulting from the exchange would

require review by both the home and host organizations; new discoveries can result in shared patents. It is recommended that the MOA address IP. Protecting a competitive advantage is not a valid reason to avoid an exchange.

Security Clearances – Some national laboratories require that most of their staff be cleared while others have a more open campus. In coordinating an exchange, the exchange candidate should consider the skills and capabilities that they wish to acquire and determine the associated clearance requirements. If they do not yet have the necessary clearances, the assignment will not be feasible. Managers and sponsors considering such an assignment would have to weigh the expense against the benefits of the increased capability. The need to know new information or acquire new expertise would have to be assessed also. The process for transferring of clearances between national laboratories is efficient and reliable so those who have the necessary clearances should have no problem getting the access they need. Security considerations would dictate whether interlaboratory exchanges would be open to foreign nationals.

Travel – Travel and lodging for exchangees should be considered unless the host location is near to the home location. ORNL, Y-12, SRNL, and WFFF are conducting exchanges in 2017. ORNL is pairing with Y-12 and SRNL is pairing with WFFF; these arrangements are local and will not require travel. This is the most convenient and cost effective model for an exchange because the exchangee does not have to be away from home for an extended period and the cost of the exchange is significantly reduced (by an estimated $50,000 for a six-month assignment as documented in an earlier section). For exchanges that are not local, the exchangee must locate housing and the sponsor must cover travel costs. Some laboratories, such as BNL and ORNL, have on-site housing. However, BNL is currently implementing a plan that will eliminate its on-site housing options by 2022, and ORNL's on-site housing is intended for the Spallation Neutron Source facility. In many locations, exchangees will be required to find short- to medium-term, off-site housing. Travel longer than 30 days in duration will be subject to the rules for extended assignments, which requires reduced per diem for a portion of the time. The travel would most likely only cover the costs of the exchangee's travel and would not cover family members. Travel would be managed similarly to a Headquarters M&O assignment.

Training – Each national laboratory has its own training requirements and requirements can vary for different facilities at a national laboratory. Some interviewees questioned the practicality of an interlaboratory exchange due to the specialized training requirements for some facilities. While there is some reciprocity for recognition of training across the DOE complex, it is not dependable. Most interviewees suggested that exchangees would be required to take the training required for the facility to which they are assigned regardless of their training history. The required training can take up to two weeks and some of the courses are only conducted once per month, meaning that it can take up to a month before the exchangee is certified to perform in their new assignment.

Duration – Most of the managers think that the exchange should be a minimum of six months for the exchangee to successfully acquire new knowledge and skills. They recognized that the length of the assignment is directly related to the cost of the assignment. Some said that the duration should not be the same for all exchanges. Factors such as family, place in career, and training requirements for the desired exchange will affect the optimal duration of the exchange.

Costs – The interviewees recognized the high cost of an interlaboratory exchange for the home laboratory. In the absence of funding from NA-241 to cover the costs of the exchangee, exchanges are not likely to happen frequently. Some labs thought the expenses of the host lab could be absorbed by the project to which the exchangee is assigned while others thought that funding for the host and mentor would be required.

Cooperation – One laboratory questioned whether labs should be expected to train another laboratory's staff. They also noted that different offices within DOE manage the various laboratories, plants and sites and some offices may not agree to an exchange that may affect operations at their facility.

Survey Results

BNL conducted a survey to gather information on the views and needs of the exchange candidate pool. The survey is provided in Appendix 2 and the results are discussed below.

Figure 1 shows the distribution of the 29 survey responses received by BNL from employees of nine DOE national laboratories. The survey was limited to employees of organizations in the DOE network. Almost half of the responses came from BNL and ORNL.

As shown in Figure 2, the responses were evenly distributed between people who self-identified as policy specialists, technical specialists, or specialists in both policy and technology. The job titles of the respondents are provided in Table 4.

Figure 3 shows that approximately 38% of the respondents charge less than half of their time to safeguards-related projects and 24% are able to charge almost all of their time to safeguards-related projects.

Sixty-nine per cent of the respondents have less than 10 years' experience and 93% have less than 15 years' experience in the safeguards field.

Figure 1: Distribution of responses to the survey. The respondents that indicated "Other" specified that they were employed at the Y-12 National Security Complex.

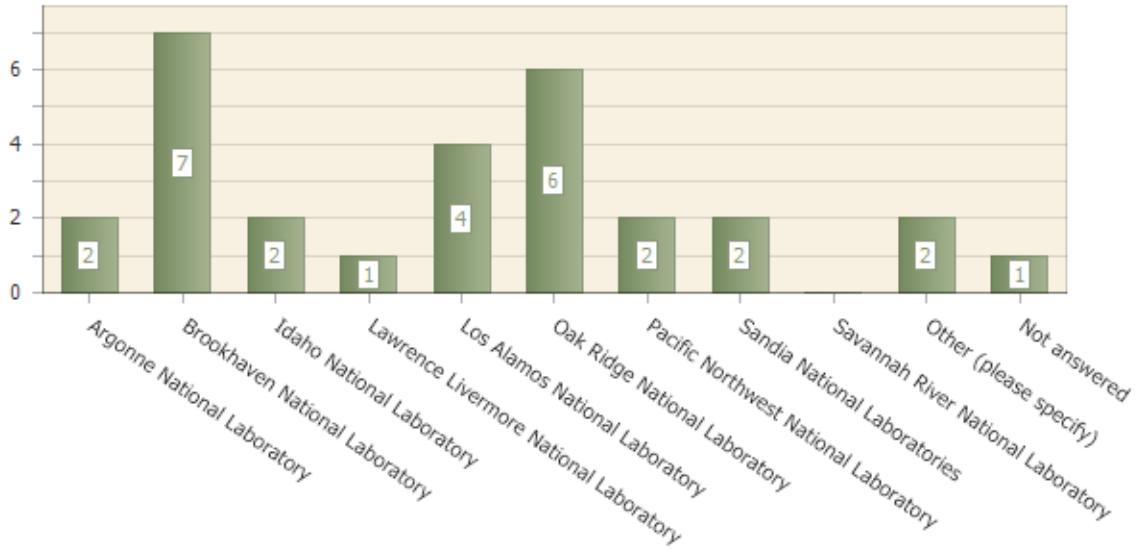


Table 5: Job Titles of Survey Respondents

Title	Number of Responses
Nonproliferation Engineer /NDA Safeguards Engineer/Electrical Engineer/Nuclear Engineer/R&D Engineer	7
Scientific Associate	5
Manager/R&D Manager/Portfolio Manager	3
Scientist/R&D Scientist/Principal Chemist	3
Sr. Member of the Technical Staff	2
Nonproliferation Policy Specialist	1
Policy Advisor	1
Safeguards R&D Staff	1
Nonproliferation Policy Scientist	1
Nonproliferation and International Safeguards Analyst	1
Systems Analysis R&D	1
Post Bachelors Research Associate	1
Post-Doctoral Appointee	1

Figure 2: Response to the question "Do you consider yourself a policy of technical specialist?

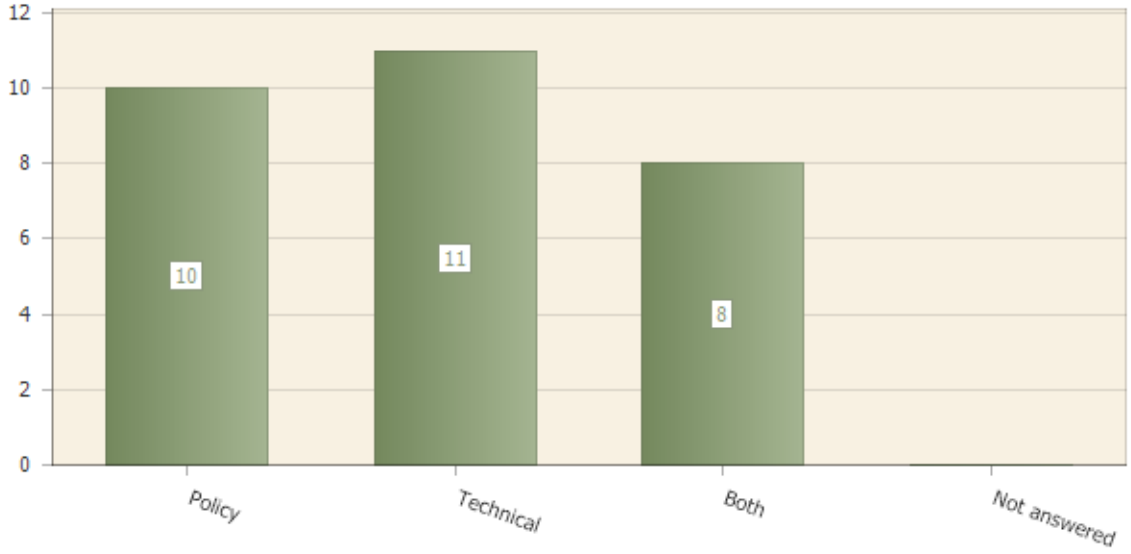


Figure 3: Percentage of time charged to safeguards-related projects

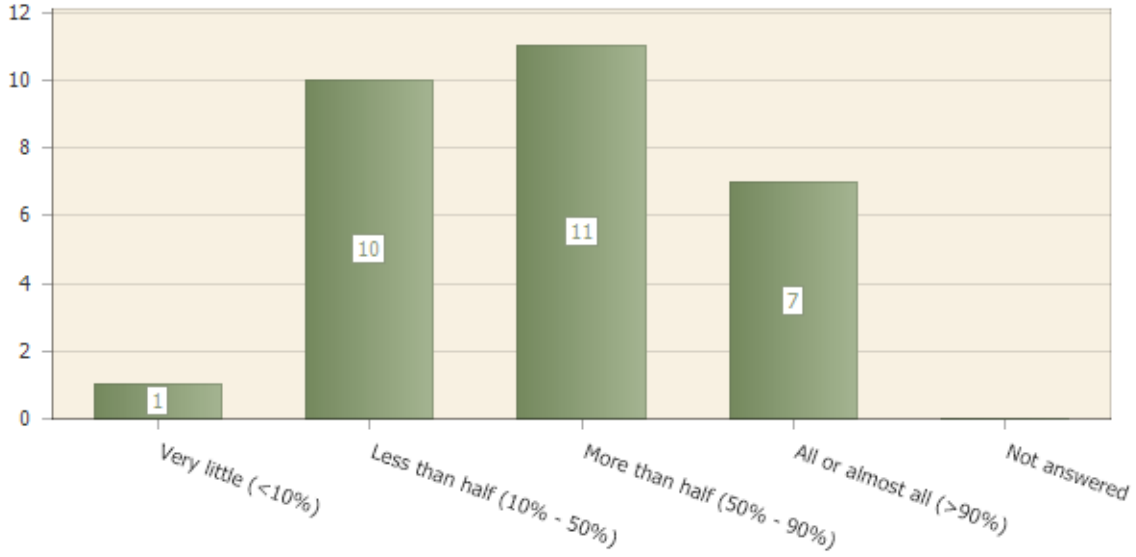
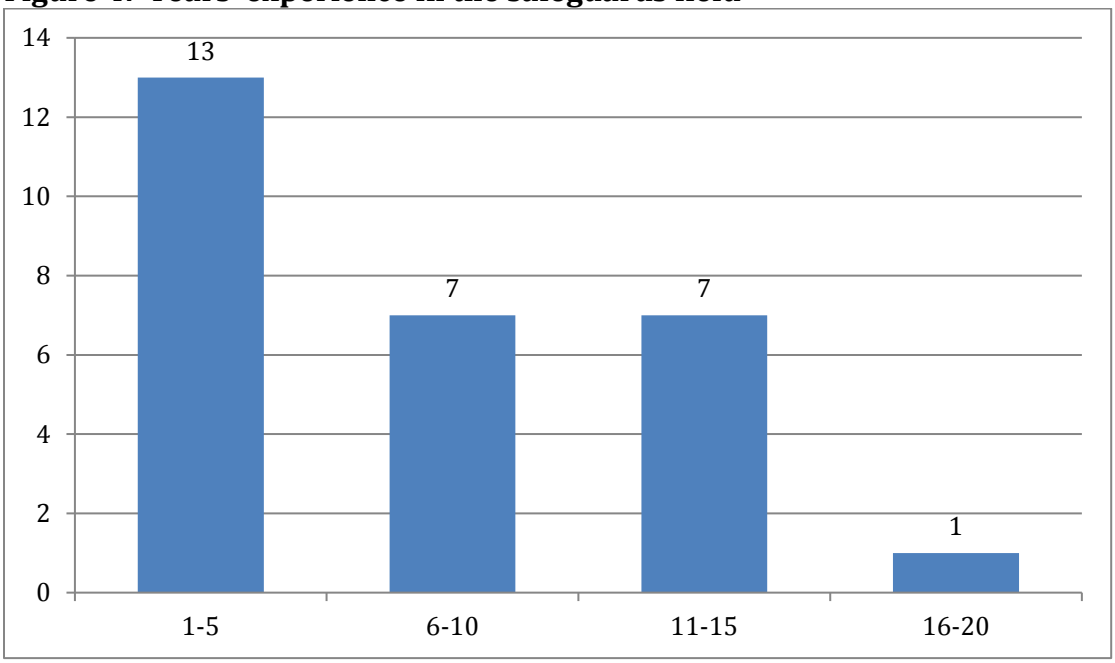


Figure 4: Years' experience in the safeguards field

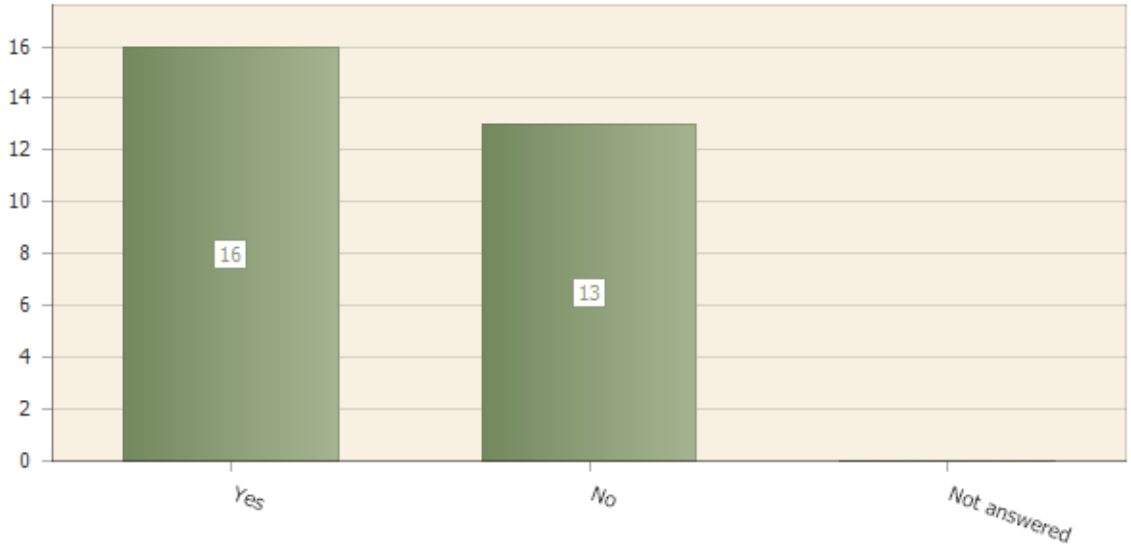


Sixteen or 55% of the respondents have had more than one employer during their career and some have had more than one previous employer. Other places the respondents have worked are summarized in Table 6. Of those with previous employment, 44% have worked at the IAEA, and 55% have worked at another DOE national laboratory. Having had more than one employer would give a better understanding of the community and its stakeholders overall, an understanding that those who have had only one employer during their career would have more difficulty obtaining. Each respondent could list multiple former employers but only one in each category is included in the count.

Table 6: Former employers of those respondents who have had more than one employer during their career to date

Other Employer	No. of individuals
International Atomic Energy Agency	7
Other international organization	2
Another DOE National Laboratory	9
Think tank	2
Nongovernmental organization	1
NNSA Graduate Fellow Program	2
NNSA	2
Other U.S. government agency	1

Figure 5: Have you had more than one employer over the course of your safeguards career?



Figures 6, 7, and 8 show the responses about familiarity with safeguards-related work done at the home laboratory versus familiarity with work at other laboratories. As expected, the responses show that the respondents are more familiar with the work done at their laboratory than they are with work done at other laboratories. Sixty-two per cent of respondents indicated that they are very familiar with their laboratory's safeguards-related programs, projects and assets while only 24% said that they have a solid understanding of other laboratories' safeguards-relevant assets and capabilities. Almost 90% do not feel reasonably well-informed about the safeguards work being conducted at other laboratories. This data shows that an interlaboratory exchange or other program, such as the Next Generation Safeguards Professional Network, that focuses on improving awareness of safeguards activities in the DOE network is of value in increasing collaboration between the national laboratories.

The respondents listed the following as comparative advantages of their home laboratories: the International Safeguards Project Office, policy analysis, the International Nuclear Safeguards engagement program, safeguards training, and training facilities, technical capabilities in nondestructive analysis, safeguards subject matter experts, access to operating nuclear fuel cycle facilities, cyber expertise, academic partnerships, open source information collection and analysis and its integration into all source analysis, membership in the Network of Analytical Laboratories, history of safeguards work, experience with international agencies, access to nuclear material and facilities, equipment, chemical analysis, radiation detection, plutonium processing, safeguards legislation and regulation development, Additional Protocol implementation, safeguards by design, environmental monitoring/sampling, uranium standards, safeguards infrastructure development,

material accountancy and control, investigating undeclared activities and facilities, containment/surveillance, information security, data analytics, weapons and weaponization signatures, electronics development for high-energy physics, safeguards for geological repositories, plant or industry environment, hands-on work in nuclear material accounting and control, active and in-depth domestic safeguards, access to plutonium, uranium and thorium, Nuclear Detection and Sensor Testing Center, export control, pyroprocessing and aqueous reprocessing.

Figure 6: Familiarity with the home laboratory's safeguards-related programs, projects and assets

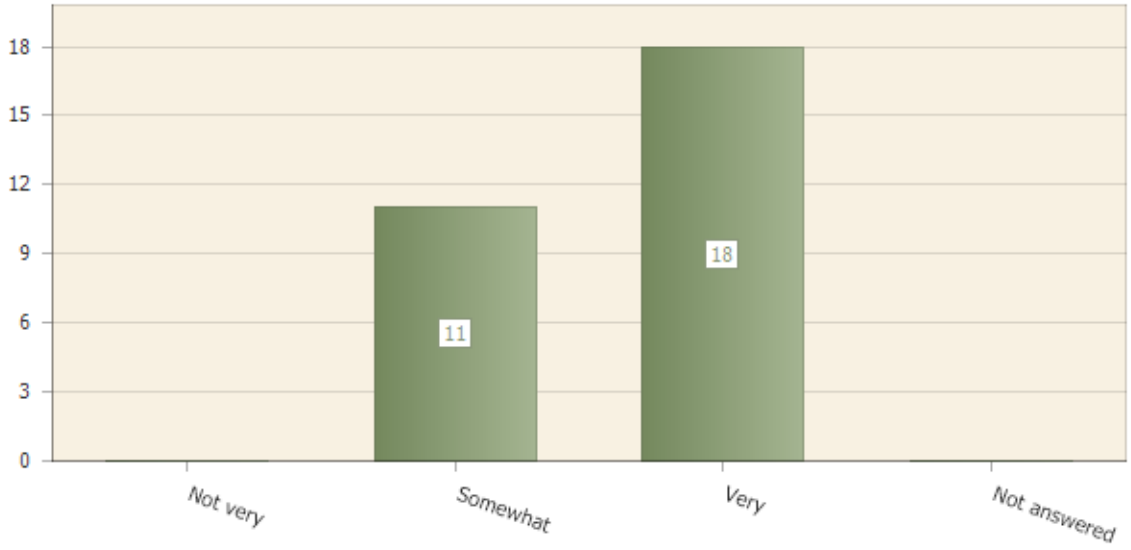
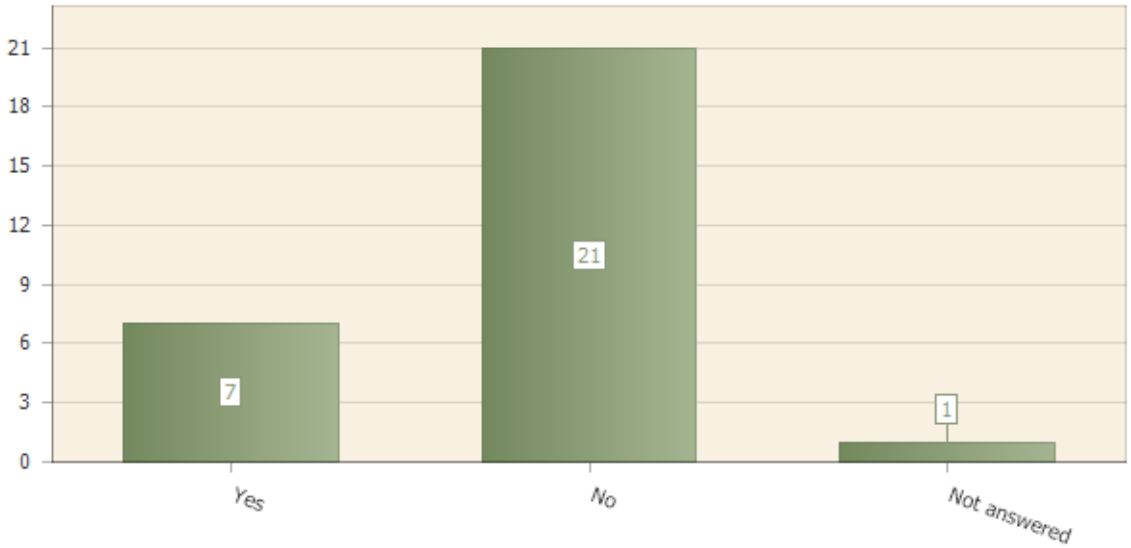


Figure 7: Solid understanding of other laboratories' safeguards-relevant assets and capabilities



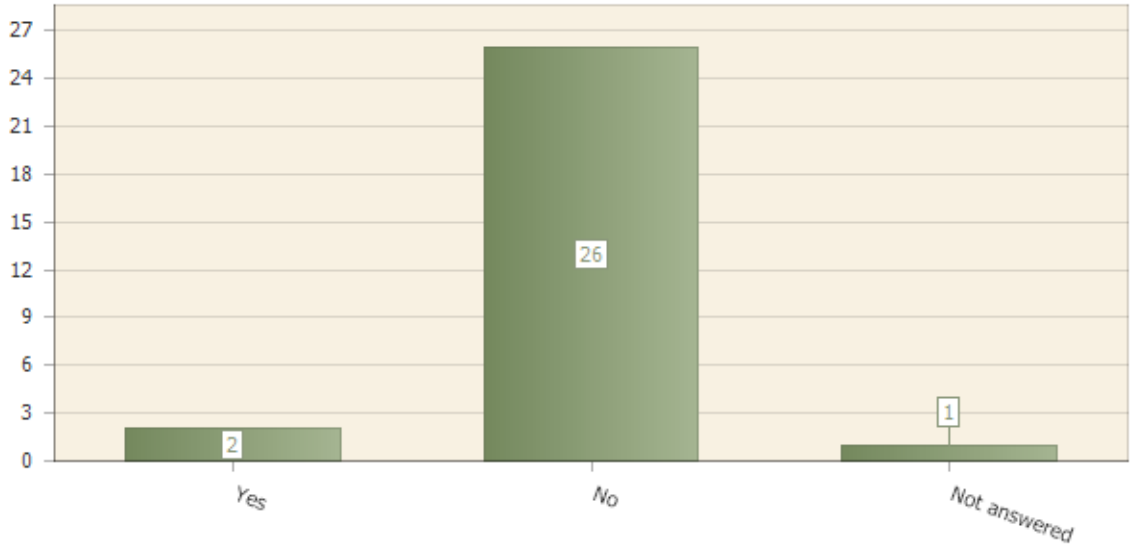
In response to the questions, “Are you interested in learning more about the safeguards assets and projects underway at other labs? If so, why?” the respondents offered the following:

- I think I have an overall picture of each lab's strengths and assets.... but I do not have the details. Being better informed of the assets, strengths, and projects can only survive[sic] to facilitate better collaboration between safeguards colleagues.
- Yes, absolutely. It's nearly impossible to submit proposals to NNSA without understanding what work is currently being done.
- Yes, it would be an asset to my work.
- Yes, I am. There are so many aspects within the safeguards regime that we can explore and it is being done though there remains room for innovation or improvement. If given an opportunity, this exposure at other laboratory will enable me to learn new things and have a broad mind to accept new possibilities.
- Yes. The safeguards field is relatively small, but being new to the field I do not know many people. I would be interested in learning more about other projects and meeting people at other laboratories in hopes of setting up collaborations.
- Yes. We have capabilities of developing detector instruments for safeguards. However, we have limited knowledge in safeguards applications, such as what safeguards people needs for radiation detection, what operational environment looks like, what specific requirements in instrument are critical.
- Yes, I'm very interested in learning more about the work going on at other labs. Often times work done at each lab is stove-piped at the lab or between the collaborators which can result in repeating work or starting on a project that has already been done elsewhere. It is also interesting to see the types of innovation going on elsewhere, especially in areas that fall in different area of expertise. Learning more also opens the door for future collaboration.
- Yes, to better enable collaborations that would utilize laboratory/personnel strengths.
- We always discuss collaborating, but that's next to impossible when you don't know other people at other labs or what they work on regularly. Outside of the courses different labs run, it's difficult to know what everyone works on, even in a general sense.
- I would like to know how their work and our work fits together better. Further, it could lead to some interesting collaborations.
- Yes- better opportunities for collaboration and joint projects
- I am interested in learning more about safeguards assets and projects at other laboratories because I'd like to see opportunities for collaboration, and see where we can be avoiding duplicate work or building on each other's successes and failures.
- Yes, more transparency into various safeguards projects would limit duplication of effort and lead to more insightful recommendations that are based on full knowledge of what work has been done in a particular field and its implications. More transparency also helps identify top experts across the complex who might

contribute to a particular study or project. More transparency also, frankly, helps laboratories focus their internal investments in areas that are not being addressed or developed by other labs. Such gap areas lead to sustained capability development and more opportunities for collaboration and partnership.

- Absolutely, we are all supposed to be on the same team, right? I'd enjoy more inter-lab collaboration.
- The only way I find out about work at other laboratories is through personal conversations with other researchers and participation in professional societies/conferences. It would be great to have a way to find out what is going on at other labs in real time. In addition, access to past and completed projects is limited; access to such information would benefit current and future research and proposals.
- Yes. It would better inform my understanding of the overall scope of US support for the IAEA and international safeguards (to help place my own work in a broader context). It would help me identify subject-matter experts who I can reach out to in case I need support.
- Yes. It would help to identify SME's and capabilities at other labs for future collaboration and to avoid duplication during proposal calls.
- Yes, absolutely. This would foster collaboration between laboratories, which is critical at a time when research budgets are limited to avoid duplication of effort or re-inventing the wheel that has already been invented elsewhere. I'm interested in multi-laboratory teaming. Currently, the only way to find out about safeguards projects underway at other laboratories is to attend conferences. I believe conference attendance is becoming harder to justify in the current funding climate (i.e., there's now a hard decision of whether to attend a conference when research budgets are already tight or whether as PI to reserve that funding to pay someone else's time to do research) but I can't think of an example where collaboration has not been a good idea.
- Yes! Even when I think I know about another lab's capabilities, I find they are doing similar work as us, or something I never knew about. There is always more to learn.
- Yes I'd like to know more about people that might be working in the same direction as me
- Yes; I think it is critical to understand the broader context of the work and existing expertise in the field in order to avoid duplication and to do efficient and effective work.
- Yes, to enable better collaboration
- I would like to know who would be available for collaboration, especially in areas in which my expertise is limited.
- Any chance to cross-pollinate with other labs increases the ability to successfully collaborate as well as reducing overlap and repeated work. More knowledge about SME's in particular areas at various laboratories will only increase the relevance of work at multiple sites.

Figure 8: Do you feel reasonably well-informed of current safeguards-related work being conducted at other labs?



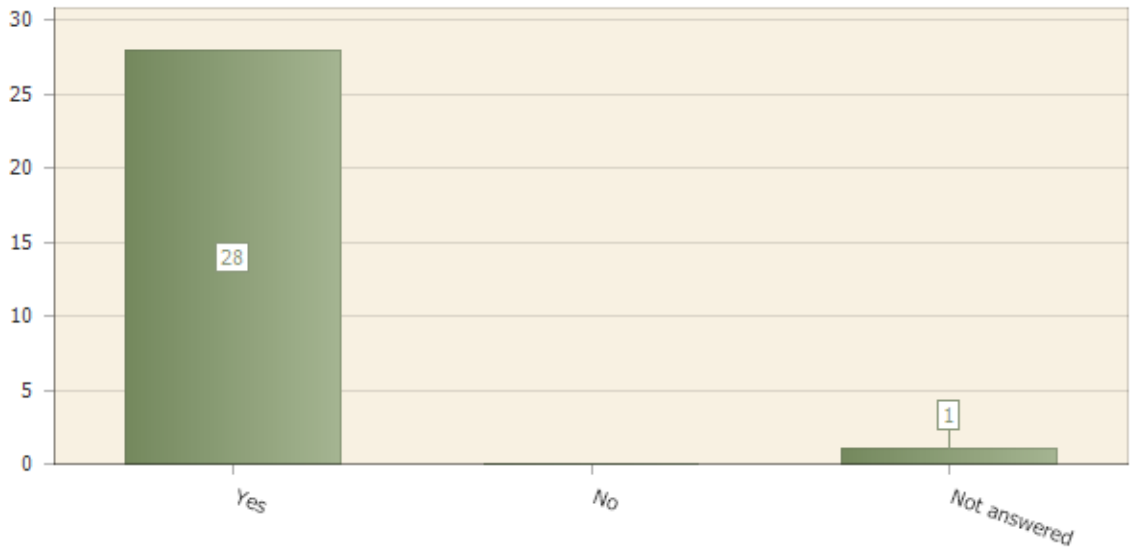
As shown in Figure 9, 97% of the respondents would find value in a reference-list of safeguards assets, core competencies and capabilities across the DOE network of national laboratories. Respondents to this question were offered the opportunity to add additional comments, and the comments offered are as follows:

- It would be difficult to keep this up-to-date but it would be a great snapshot and resource. A list of ongoing projects would be great. I do flip through the budget which has typically one line that I can try to extrapolate but this is incomplete and cumbersome.
- This would be valuable to ISPO and recruitment whenever a new opportunity became available, CFE or JPO. By having a list such as this, it would be a quick reference guide for whom to reach out and inquire about interest.
- It also offers a reference to determine what remains to be done.
- I see ISEE program [International Safeguards Employee Exchange] will make the case of 1+1>2.
- A reference list would be incredibly helpful for collaboration and future proposals.
- …but only if it is regularly updated.
- This would be particularly useful for proposal season but only if it was very well maintained.
- Including list of safeguards training courses and training facilities would also be helpful. If we have a staff member interested in a particular area, where can he/she go if their lab does not have expertise in that area? Also, it would help to have a list of completed safeguards projects categorized by domain/topic.
- To my knowledge no such list exists. Again, the only way I find out about them is through personal conversations with other researchers and participation in professional societies/conferences. It would be great to have a way to find out

more information about the lab complex to form more strategic partnerships which increase impact of projects. Access to such information would benefit current and future research and proposals.

- Yes. I can imagine that this would help the laboratories look for collaboration and teaming opportunities and help funding sponsors strategically fund safeguards work. This could also assist the peer-review process by having partner laboratories working on similar aspects of safeguards work.
- Some labs might find this to be proprietary, or giving away some sort of competitive advantage. Some of the capabilities at the labs are also sensitive for security purposes.
- The concern I have about a reference-list of safeguards core competencies is that we don't want things to be "stove-piped" where one lab does one field of work. Collaborations, exchanges, training courses, presentations at technical meetings, etc. will help ensure that different people with different experience and background can contribute to projects and keep fresh ideas coming to ensure we do the best work.
- I made recommendations to this effect last FY. I think it is key to enabling effective research

Figure 9: Do you see benefit in having a reference-list of safeguards assets, core competencies and capabilities, as well as a list of ongoing safeguards-related project work conducted across the lab complex?

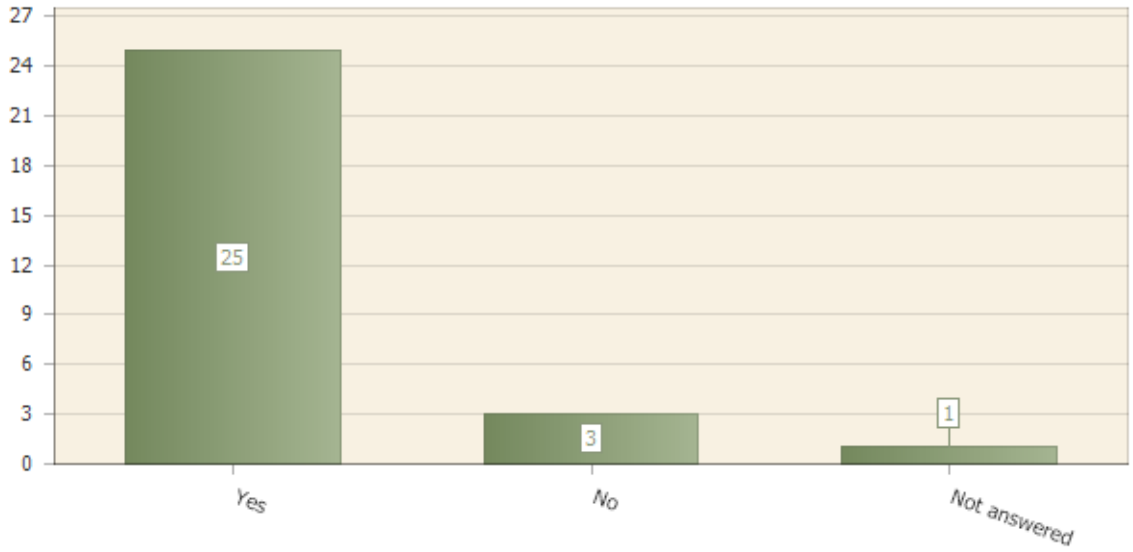


Eighty-six per cent of the respondents would like to visit or collaborate with other DOE laboratories. When asked to name the sites and programs of interest, some respondents named specific national laboratories; most identified the type of experience or program that they would like to visit or gain experience with. A few indicated that their lack of familiarity with the DOE complex impeded their ability to answer this question. The national laboratories and programs of interest to the respondents are:

- I am personally interested in the policy type work that goes on at LLNL and the Seattle office of PNNL. It is extremely unlikely I would ever move to the US West Coast. A short term project at one of these facilities would help strengthen this aspect of my skills and knowledge. Contributing to a specific project may be the best path forward. I would love to be able to support any possible multilateral negotiations with DPRK in the future. I think this type of experience would make me a more attractive candidate should the occasion ever arise. I am also very interested in an exchange with the private sector. Spending time with a safeguards group in the private sector would give me greater insight into domestic safeguards and the crossroads with international safeguards. Such an experience would give me vital insight and bolster my operational experience increasing my credibility as a safeguards professional.
- I would like more technical and operation experience to understand better the nuclear fuel cycle and proliferation indicators.
- I am interested in working with BNL and LANL. Both of these labs have an excellent program in place and provides an opportunity to new professionals to learn. A mentorship program is exciting for me to experience various things at the other lab.
- Given that I don't know what other laboratories are doing, I can't answer this very well. I'm interested in having mentor, expanding my knowledge of general safeguards techniques, and possible locations for field testing equipment.
- I will be looking for technical experience related to use of radiation instrument. LANL/SNL/ORNL may be helpful.
- Too many examples to list, but in summary I think the other laboratories offer capabilities (facilities/expertise) that can be better tapped into. It doesn't mean that NA-241 projects do not do this well already (they actually do it better than many others in my opinion), but there is always room for improvement!
- I would like to see more about what happens at operational facilities. Y12 is of particular interest to me.
- I would be interested in opportunities to receive mentoring as well as the ability to develop proposals for collaborative rather than competitive work
- I'm always interested in safeguards opportunities at any laboratory or facility. I'm particularly interested in seeing some of the reactor modeling for safeguards work taking place, and safeguards training work.
- Partner collaborations are project specific, so it is difficult to call out individuals. For this reason, I would want to survey many more people at my lab to answer this question. There are a number of safeguards professionals at my lab who did not receive this survey, and their input would be useful here. Moreover, because many safeguards staff have only worked at one, maybe two labs at most, we don't have insights about the capabilities of other National Laboratories. It is challenging to answer this question as a result; more transparency across the programs and labs would help us address this.

- Generally, we lack facility experience. I feel like we would be more effective in safeguards-related work if we had a better understanding of how the operations side works.
- Since I do not have much knowledge of and there is no list of safeguards assets, etc. I cannot say which I would be interested in, but rather that I would be interested in learning from the experience of other laboratories thought mentorship, hands-on training or facility visits. Should a list be provided I might be able to indicate more specific interests.
- I would appreciate mentoring opportunities, as well as opportunities to engage with subject-matter experts or access relevant facilities at other labs, as current assignments or projects demand.
- The Pu facility at LANL and the enrichment facilities at ORNL would be helpful to visit.
- More broadly, I'm interested in the entire safeguards technology development life cycle and how that technology ends up in the hands of the IAEA or is requested by the IAEA. Specifically, I'd be interested to learn more about ISPO as the interface between the IAEA and the US on safeguards work. Also, the day-to-day business of being a nuclear inspector and how that technology is really used in the field (not just academically) and the most useful formats for results, reporting, technology interface, etc. For the project that I work on today, any laboratory with access to fresh fuel assemblies for measurements would be of interest.
- We regularly collaborate with other labs, and academia. I work mostly with PNNL given my history there, and LLNL and ANL due to professional connections. But I would be interested in expanding my network with others.
- I am definitely interested in mentorship opportunities. I would like to have exposure to some of the larger technical groups at other labs.
- As a young professional, tours and other similar experiences help build expertise and collaboration networks. I have little experience with plutonium, so this would be the area I would be most interested in gaining experience.
- I would be interested in opportunities to visit other laboratories to learn about their safeguards portfolios and how my home institution can help as well as vice versa. In many cases, technical experts in a particular sub-field are needed to complete projects that may not exist at every laboratory. Test bed facilities of all stripes and levels are very useful for testing of technologies or methods once stood up.

Figure 10: Are there facilities you would like to visit and/or people with whom you would like to collaborate at other laboratories?



As shown in Figure 11, 69% of the respondents indicated that there is a specific subject matter expertise that they want to acquire. Fourteen per cent said there was no specific subject matter expertise that they wanted to obtain and 17% did not answer this question. The specific subject matter is identified in Table 7 below.

Figure 11: Is there a specific subject-matter expertise that you would like to acquire, or would better position you to support the IAEA's safeguards mission?

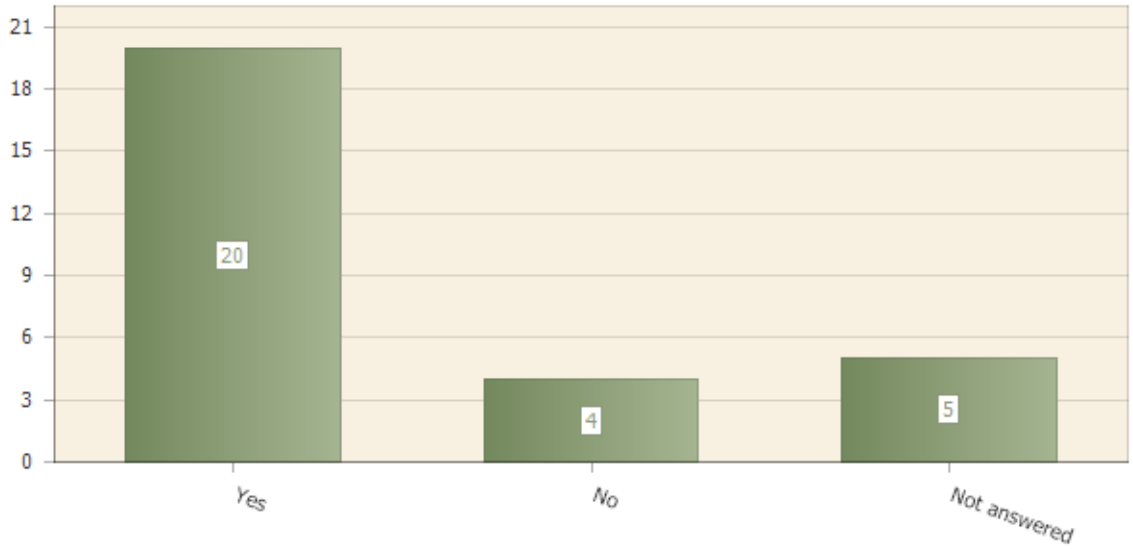


Table 7: Subject matter expertise of interest to the respondents

Subject Matter Expertise	No. of respondents interested
Country specific expertise (e.g., DPRK)	1
Domestic safeguards implementation	1
Understanding of other lab capabilities	1
Safeguards tools (e.g., nuclear material accountancy, open source information analysis)	2
Material processing	1
International safeguards implementation (e.g., in non-nuclear weapons states, Additional Protocol states, inspection and inspection preparation)	4
Nondestructive Analysis – neutron acquisition	1
Facility operations	1
Statistics	1
Hands-on experience	1
Nuclear fuel cycle	2
Additional Protocol implementation	1
Safeguards technology lifecycle (including IAEA needs/requests, technology planning and development)	2
Reprocessing	1
Plutonium elements of fuel cycle	1
Knowledge retention activities	1

Figure 12 shows that the majority of respondents, 22 of 29 or 76%, are interested in taking part in an interlaboratory exchange as a means to strengthen their career.

The survey then turned to questions related to the scope, duration, and location of the exchange. The respondents were asked to identify all of the exchange structures that would be of interest to them. The most popular options, selected by half or more of the respondents, would be a two-week program that involved short-term collaboration and mentoring (62%), a close proximity program that doesn't involve relocation (50%), and professional development (66%). Most options, including six-month assignments requiring relocation, were desirable to one in four respondents. Twenty-four per cent of the respondents did not answer this question. The respondents provided the following free-form information regarding the logistics that would affect their accepting an interlaboratory exchange opportunity:

- I do have a child and she would be coming with me. Therefore, childcare would be my main concern. A stipend to cover a nanny or the cost of a family member to come with me would be a variable in whether I did an exchange (or if a per diem was provided I could try to make it work within that amount). I recognize

that a three month stretch would be valuable but personally it may be more difficult to arrange. During the winter would actually be better for me as my child is not school age and my husband's work is seasonal. What facility I would go to may be impacted by where I have family located already to know I have a support network.

- I have young children at home, so an extended exchange is not possible at this time. The idea of an exchange during the summer is very attractive and would improve the odds logistically that I could attend.
- I think anything more than a two week program would be too disruptive to current work/family obligations, but that is just for me.
- Not the spring. I coach a high school sport at that time of year.
- it might not be feasible to do the short-term programs if it takes a significant amount of time to complete training for facility requirements- especially the nuclear facilities
- I would only be able to relocate if it were for a long period of time (1+ years) and my husband could also find a temporary position, and we had a family relocation reimbursement to help us find our son daycare and/or schooling in the new location. A short program (~2 weeks) is preferable.
- Logistical restrictions are significant for nearly all aforementioned opportunities. With two young children at home and a working spouse, leaving home for anything longer than a week can be very challenging. I also would find it challenging to leave work for more than 2 weeks as I have other responsibilities and projects that would need delegates. It is really impossible to remove children from school unless they are out an entire year (an option not listed above). Even then, my spouse would need to find work or alternate arrangements for a year, which complicates his transition back to work. The best options are non-relo, private sector and academic exchanges (with regional universities and companies), and prof development options.
- I have kids and a working spouse, so long-term exchanges wouldn't work for me. Fortunately, we have local facilities that would be ideal.
- Balancing the experience with regular job requirements. Will work at home be guaranteed? Would you need to do both? It would be interesting to have a program part time and work on regular work remotely the other half. End of FY workload is high so earlier in the FY would be more manageable. It would be difficult to manage personal life long distance if it's a long term opportunity (bills, family, etc.). Cost of relocation; I'd assume this would be covered (hotel? per diem etc.). I'd like to learn something and be able to practice it.
- A one week (facility tour + technical skills training) would be an attractive option. Small child at home, would need to be able to secure childcare at location of residency.
- I have kids, so relocation or training for more than a week would be difficult.
- Longer than 2 weeks is challenging to manage projects at one's home institution (unless it is part-time, and you expect to continue part time work on your other projects while off-site). I would recommend a one-year program that includes family relocation assistance...this would be the least disruptive to work

schedules if it coincided with a full FY, but also probably easier for families with kids in schools if it lined up with the school calendar.

- My biggest logistical gripe would be taking care of furniture but I dont think it would be a major barrior. certainly it would be useful if the lab worked something out to have prefurnished dormitories or the like for the 6 month appointments
- Longer efforts require quite a bit of coordination that I think would really limit the number of folks who could participate (what to do with moving to the site - renting, kids' school, etc - along with who would cover your effort on existing projects) but 2 weeks is short enough where none of that would matter. Short intervals may be less effective but it is easier to get management support.
- I have a wife and kids at home, however, they are still young and would be able to move.
- A combination of on-site and telework would be beneficial - i.e. 50% time devoted to training and telepresence learning followed by hands on aspects at the host site. Family considerations are significant especially for longer term movements. Close coordination with the home facility is paramount to ensure that the individual has continuity during and after any exchange.

Respondents were asked whether there is a preferred season for an exchange and Figure 14 shows that there is a preference for the fall. Respondents were allowed to select more than one timeframe and they selected an average of 2.6 seasons.

Figure 12: Would you be interested in bolstering your safeguards-related skills and expertise through an NNSA-sponsored laboratory exchange program?

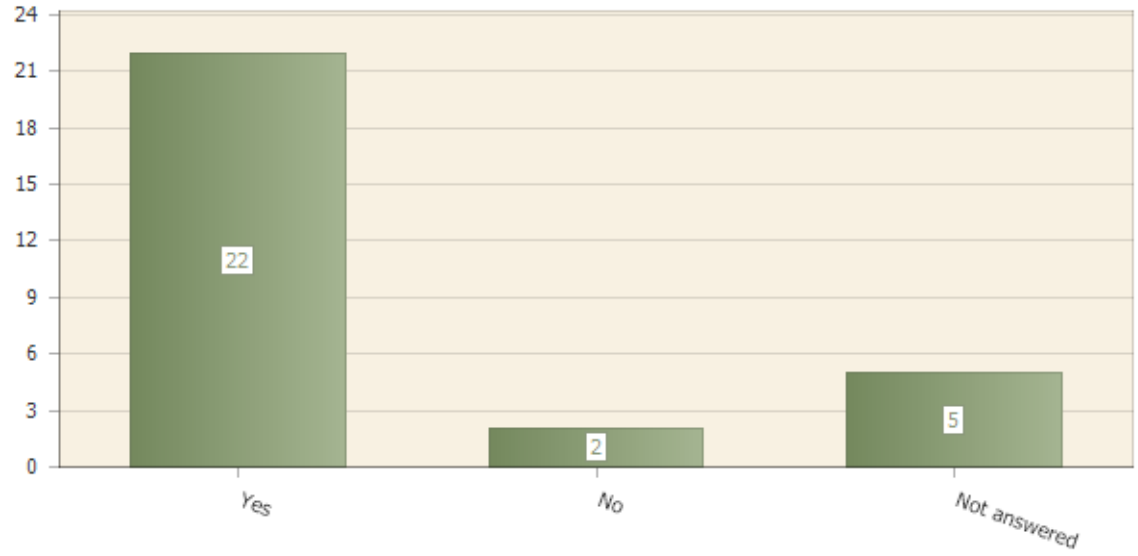


Figure 13: Which of the following [exchange] structures do you find attractive?

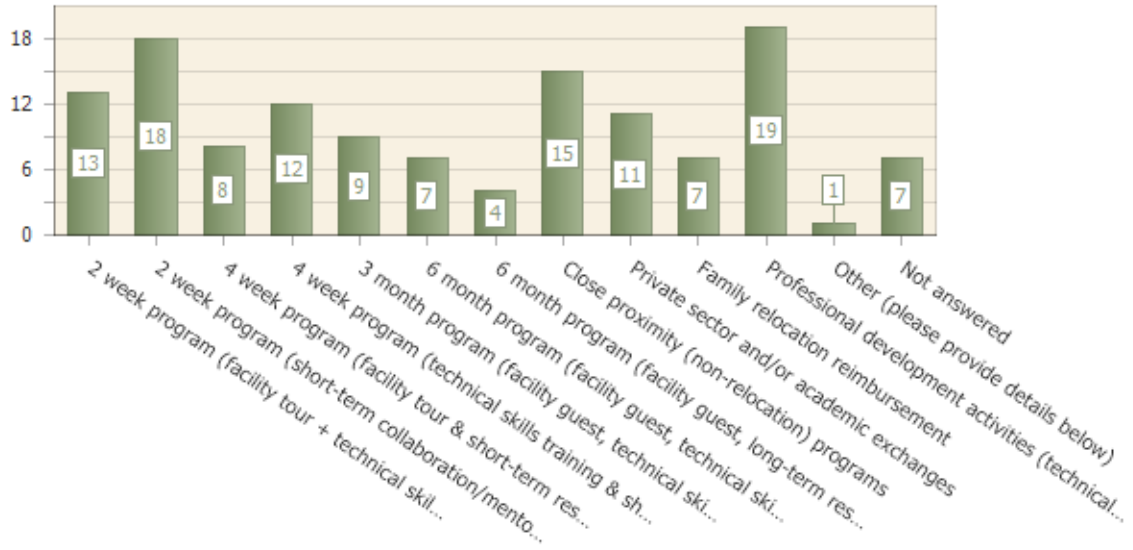
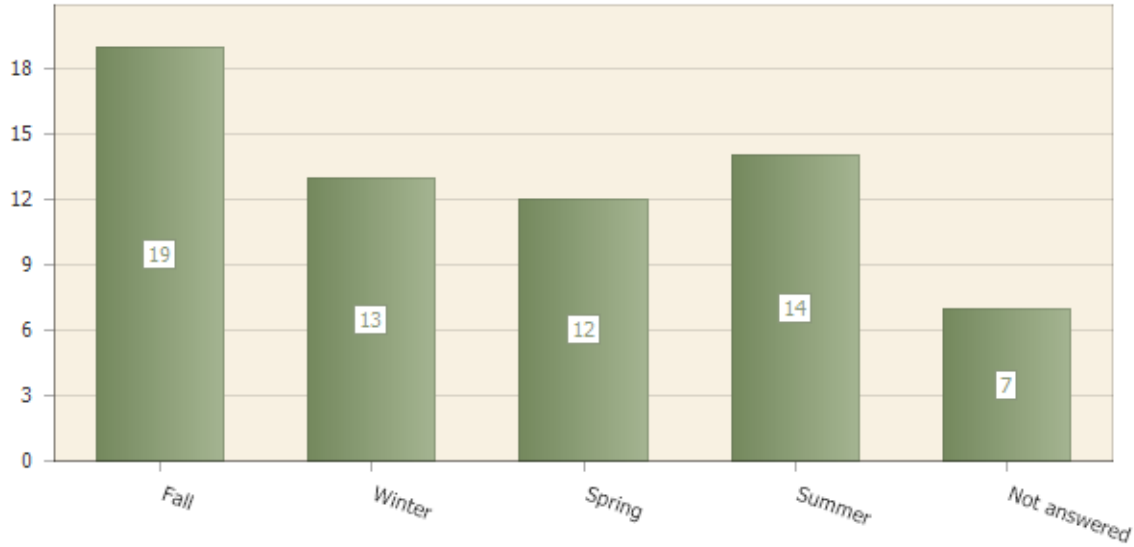


Figure 14: What times of year are most attractive to you?

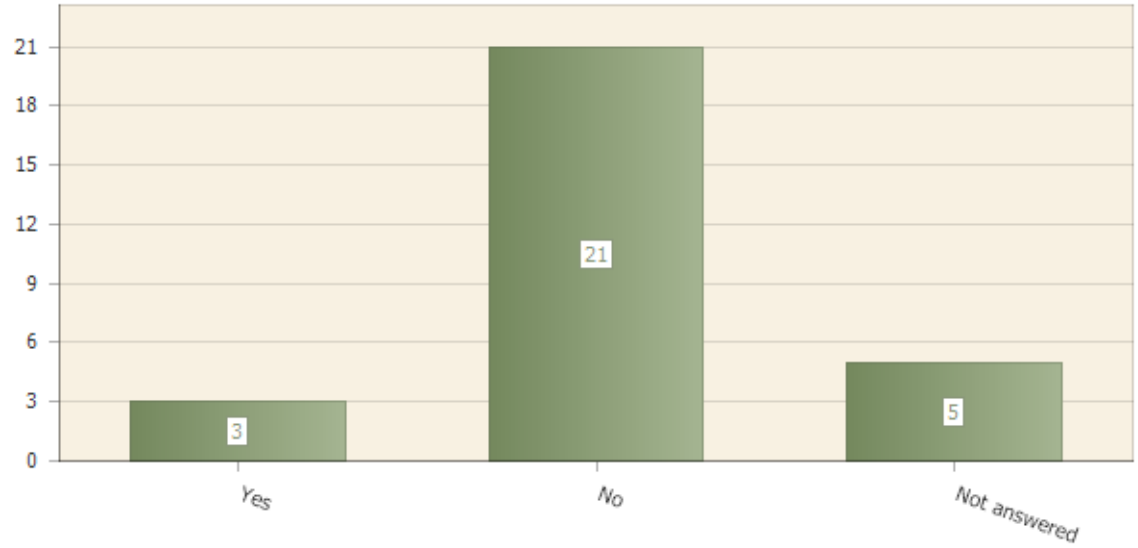


The penultimate question of the survey asked if respondents had ever participated in a "professional exchange program." Only three respondents, or 10%, indicated that they had been on an exchange previously and give did not answer. It is important to note that the question did not define "professional exchange," and that at least seven of the respondents indicated that they had worked at the IAEA, at

another international organization or as a NNSA Graduate Fellow, which could be considered professional exchanges. Moreover, many of the respondents are likely to have participated in the Next Generation Safeguards Professional Network meetings and NA-241 short courses that have similarities to the exchange formats identified in this study. Therefore, the real number of exchange participants may be higher than indicated by the survey. The respondents who indicated that they had participated in a professional exchange program provided the following information:

- I enjoy the networking that takes place in these exchanges, and I have had positive experiences.
- Presidential Management Fellowship (PMF) Fellows are required to go on rotation for at least 6 months to another Federal agency. It's a great way to gain experience and understanding of the U.S. interagency. Not all home agencies treat their PMF's equally, though. Some are more willing to send their staff on rotation than others because they fear poaching.
- I have participated as a researcher and as a guest lecturer and teacher. In my opinion, exchanges work best when the research topic or area is clearly defined from the beginning if the exchange time will be for less than 3 months. If the time period is longer, then a broad challenge or question can be posed and the individual can be given time to explore the topic and be creative. My experiences have all been positive, but I think the better defined ones have been the most so. I also would not underestimate the potential input by the exchangee and I would ensure the logistics allow for individuals with initiative to add real, substantive value to an on-going project or to create a new one.

Figure 15: Have you previously participated in a professional exchange program?



The survey closed with an opportunity for the respondents to comments or feedback on the survey and the interlaboratory exchange concept. The information they provided is as follows:

- Great idea!
- A great program to address the future needs.
- I think this is a GREAT idea. You may want to consider offering this to industry professionals as well, those who develop/sell equipment and software used in safeguards, so they can better understand the safeguards field.
- This survey is a good idea!
- I would just like to emphasize that the feedback I provided is obviously unique to me and my situation. There are many other early and mid career staff who would likely be in a better position to take advantage of training opportunities and professional exchanges at other labs at this point in time. They also have other project needs and interests that I failed to capture here. I would recommend sending this survey out more broadly to ensure their views are reflected. Alternatively, if sharing lists of information (as suggested in one of the questions) proves challenging, program reviews focusing on particular topics or technical projects also serve a valuable info sharing function that would help people identify collaborators, avoid duplication of effort, and improve findings. Either way, more transparency across the labs would be beneficial.
- Thank you for this opportunity to provide feedback. I hope you also reached out to other PNNL staff for this survey including the previously mentioned peers in addition to: Eric Smith, Mark Schanfein, James Ely, Sarah Frazar, Mark Killinger, Becky Jones, Oksana Elkhamri, Fred Morris, and Michael Curtis.
- I think this is a great idea. Many thanks for the opportunity to participate in this survey and provide feedback. A final thought is that, if you haven't done so already, perhaps you could look at examples of technical exchange programs and work site rotations from the private nuclear industry that have been performed in the past. Examples off the top of my head include former BNFL, AREVA (Gap Expert Program - I'd be happy to discuss offline at length), and the United Kingdom Nuclear Decommissioning Authority.
- Interesting idea! Would be much easier for professionals without young families. There would have to be some coordination with home institutions regarding a staff member's status during the program - still an employee of their home institution, on leave, how it impacts medical insurance coverage in different areas, etc. Lots of logistical considerations...moving folks for longer periods can be quite expensive.
- I think this a great idea!

Criteria and Metrics

NA-241 has expressed interest in defining metrics to show the effect of its Human Capital Development program. Because an interlaboratory exchange program would require a large investment, it is prudent to establish metrics for the program before it begins. At the same time, assessing a program which has the potential for such diversity as this presents challenges. It will be difficult to measure the impact of an assignment on an individual's career. Ideally NA-241 should use a combination of criteria for determining whether an exchange should be funded and metrics for assessment of the impact of the exchange. The authors recommend the following approach:

1. Proposal for assignment – The prospective exchangee should propose the exchange through the annual NA-241 call for proposals. Before submission, the proposal should be discussed with the host laboratory and should include a statement of work that includes the purpose of the exchange, the skills, expertise and knowledge that the exchangee expects to gain, and the future activities for which it will prepare them. This will give NA-241 a good basis upon which to make a decision regarding funding and ensure that all stakeholders have reasonable expectations for the exchange.
2. Alignment – Several people have opined during the course of this study that exchanges should be of benefit to the exchangee, the home laboratory, the host laboratory and NNSA. The goals and objectives of the exchange should align with the goals and objectives of the stakeholders.
3. Growth - The exchange proposal can serve as the basis of an assessment of the change in the exchangee's level of expertise before and after the exchange. Because each exchangee will have different objectives, the assessment should be customized to the exchangee. It is suggested that the assessments be performed as interviews, be conducted by NA-241 staff, and be documented. The documentation from the interviews can be compared to assess the change in level of expertise of the exchangee resulting from the assignment.
4. Career path – NA-241 should follow the exchangee's career for at least five years following the exchange to determine if the exchangee reached his or her exchange goals. Since the original proposal contained the exchangee's expectation of the activities for which the exchange would prepare them, it will be relatively simple to determine if the exchangee took part in these activities after a reasonable period. For example, did the exchange become an IAEA inspector or were they able to provide support to INSEP activities? NNSA may have its own expectations for the individual, which should be documented before the start of the exchange. NNSA goals may include joining the IAEA as an inspector or resolving a technical question.

Conclusions and Recommendations

There was an overwhelmingly positive response from the laboratory managers that BNL interviewed as well as the respondents to BNL's survey. All thought the idea of

an interlaboratory exchange was a good idea and that it would have a positive impact on the careers of early and mid-career safeguards professionals.

Exchanges can and should be mutually beneficial to all stakeholders, including home and host laboratories, the sponsor and the exchangee. The scope of work of the exchange should align with the stakeholders' goals and objectives. The study identified the following advantages to exchanges:

- Increasing the personal experience of the exchangee as well as the collective experience within the safeguards community
- Assisting safeguards practitioners in broadening their skills and experience
- Assisting the U.S. government in creating a pool of well-qualified candidates for positions in the IAEA Department of Safeguards
- Ensuring the future stewardship of U.S. national laboratory nuclear facilities
- Knowledge management
- Networking
- Providing professional development opportunities that the individual national laboratories cannot offer themselves
- Replacement of retiring staff
- Cross training and training of young professionals

It was originally envisioned that laboratory personnel would undertake simultaneous exchanges at complementary laboratories. However, ORNL's and Y-12's pilot program shows that it may be impractical to expect that both parties will be ready to undertake their exchange assignments at the exact same time. While there may be benefits to doing simultaneous exchanges, in many cases it is not necessary. Moreover, this study found that it is not necessary for the laboratories to exchange staff members. It is conceivable that Laboratory A would host an employee of Laboratory B without having the expectation that Laboratory B would host a Laboratory A employee.

Financial sponsorship will be necessary to conduct exchanges, and this study found that the expected cost of an exchange is significant. There will be both quantitative costs (those related to labor and travel), and qualitative costs (those associated with disruption of normal work schedules and processes). NA-241 is the most likely source of funding. Because of this cost and the need for sponsorship, exchanges are not likely to happen frequently. However, the value of a sporadic interlaboratory exchange program should not be ignored. One successful exchange could have a large return on investment. A well-conceived and well-executed exchange can bring together stakeholders with complementary expertise to create a new capability or area of research. NA-241 should not discount the value of exchanges because they are expensive and will not be routine.

Because the national laboratories fall under the common umbrella of U.S. Department of Energy management, it is unlikely that labor, human resources, or liability considerations would prevent an exchange from being arranged. National laboratory employees routinely perform work at other DOE facilities and are indemnified for it by the DOE. There is no need for the exchangee's employment status to change; they will continue to be paid and accrue benefits from their home laboratory. Security clearances are easily transferred between laboratories. And travel related to their exchange can be addressed under existing DOE travel policies. Managers indicated that exchanges with private sector entities would be of value, but that they would be more difficult to arrange due to different organizational policies and procedures.

An anticipated administrative difficulty is that training is rarely transferable to other laboratories. Exchangees will likely spend significant time repeating training that they have already taken at their home laboratory.

The managers identified poaching as a disadvantage of exchanges. Exchanges provide an opportunity for the host laboratory to recognize a valuable individual and for the exchangee to become acquainted with an alternate employer. A successful experience during the exchange may lead to the host laboratory offering a position to the exchangee. The home laboratory would be significantly disadvantaged if the exchangee left the laboratory because of the exchange. Some managers saw this as a natural result of career progression, while others viewed it in a very negative light.

Managers and prospective exchangees differ in their opinions of the optimal length of the assignment. Most managers believe that a longer (3-6 month) assignment would be optimal for the exchangee to become embedded and fully functional at the host facility. While tours and some facility familiarization can be accomplished in a one- or two-week exchange, an exchange is undertaken to gain a new skill or expertise would require a long duration. Moreover, because some facilities have lengthy training requirements, a short duration exchange would not be practical. In order to accept this burden, the host would want the exchange to be long enough that the exchangee would be able to contribute to the host laboratory. Many prospective exchangees have spouses and young children and in their responses to the survey, many expressed concerns about being away from their families for an extended period. Some respondents indicated that family members would not join them on an exchange and for that reason, the longer-term exchanges were not an option for them.

Managers recommended that the home and host laboratories have a memorandum of agreement (MOA) to document the terms and conditions for the exchange. The MOA should include a detailed scope of work for the assignment and should address the requirements for security, training, medical insurance and intellectual property (IP) that is created during the exchange. A nondisclosure agreement may be necessary to protect the pre-existing IP of the stakeholders.

Appendix 1: Interview Questions

For home laboratories:

1. Does your laboratory offer professional exchanges?
    a. Personally do any of you have experience with professional exchanges, either as an assignee or a supervisor/manager? If so, what was the value?
    b. Have you ever participated in a rotation? If so, what was the value?
    c. Should laboratory exchanges be limited to the DOE laboratory network or would exchanges with private organizations be useful/possible too?
    d. What is the scope and depth of your relationship with Westinghouse? Have you conducted exchanges with them?
2. Would you encourage employees to participate in a laboratory exchange?
    a. What concerns, if any, do you have about loss of manpower or expertise while an employee is on an off-site assignment?
3. What do you believe would be the optimal assignment length? 2 weeks, 1 month, 3 months, six months?
    a. What should be considered in the scope of the assignment? Tours, seminars, projects,…
4. Does your facility have in place services that are necessary to support employees on offsite assignments? If so, what services are available?
5. Are there any legal concerns with professional exchanges that we should be aware of?
    a. Would existing medical insurance cover employees working at another site?
    b. Is there safety liability?
    c. Are there intellectual property concerns that would have to be addressed for a successful exchange? Would IP issues prevent certain types of assignments?
    d. Are your travel policies supportive of an extended term assignment at another facility? Are there provisions to allow spouse and children to join the employee at the assignment location?
    e. What obstacles, if any, do you foresee to paying employees while they are working offsite?
    f. Would your HR policies allow an employee to remain employed (and continue receiving compensation and benefits) while working at another facility?

For host laboratories:

1. Legal
    a. Would medical coverage from another site be sufficient to cover outside people working at your site?
    b. Are visitors indemnified against damage caused while on site?
    c. Are there intellectual property concerns that would have to be addressed for a successful exchange? Would IP issues prevent certain types of assignments?
2. Are there significant security requirements for access to the laboratory and/or to specific laboratory facilities?
    a. Is a specific DOE clearance level required for work at your site or access to specific facilities? Is US citizenship required?
    b. What facility is the most restrictive?
3. What level of education is typically required for work at your site?
4. What safeguards relevant skills and expertise do you think are unique to your laboratory?
5. Are there intellectual property concerns that would have to be addressed for a successful exchange? Would IP issues prevent certain types of assignments?
6. What housing accommodations are available for guests?
7. Is there a project your working on that would benefit from outside expertise?

Appendix 2: Survey Questions

Appendix 3: Project Work Plan

PWP for Facility Experience through Professional Staff Exchange

Summary of Work:
BNL, ORNL, SRNL, and Y-12 will collaborate on an OINS HCD project to evaluate the feasibility of conducting a staff exchange between national laboratories, NNSA HQ, and the private sector, as well as conduct a pilot exchange between ORNL and Y-12.

Scope of Work:
The project will be divided into a feasibility study and a pilot program, with the results of both being in a final report.

Feasibility Study
BNL will focus on the possibility of an inter-lab exchange across the DOE network. SRNL will focus on the possibility of an exchange between SRNL and the Westinghouse Fuel Fabrication Facility (WFFF). During the study the PIs will collect information and conduct interviews to understand:

- the challenges of implementation,
- the willingness of laboratories and WFFF to cooperate,
- the possible technical areas of expertise that would be appropriate for an exchange,
- the cost estimates (using a 3-6 month exchange),
- the HR policies, and
- the benefits of an exchange at individual and organizational level.

Pilot Program
ORNL and Y-12 will focus on implementing an exchange beginning in the Q2FY17 of a mid-career and young professional. The part-time exchange over 5 months will be for two individuals whose careers have an identifiable knowledge or experience gap that can be met by working on a project at the other lab. The pilot program will capture information related to the issues described above in the feasibility study.

Deliverables:
The team will deliver quarterly reports in December 2016 and March and June 2017. The team will meet once in Washington, DC, or another convenient location in the March 2017 timeframe to discuss approaches, challenges, and results to date. A final report to be delivered in August 2017 will address the feasibility study and the results of the pilot program. This delivery can be followed-up with a videoconference or DC trip in September. Topics to be covered in the final report may include:

- The type of work that can be done on exchange (areas of expertise)
- What are the common challenges the teams faced, and how do they inform the challenges of implementing an exchange program across the complex?

- Did collaboration ameliorate any of these challenges?
- How were your approaches similar? How were they distinct? What lessons learned/best-practices from each could be used to form a wider exchange-program?

Travel Budget:
Requesting $3k per person