Advancing Private Sector R&D through GAIN

ARPA-E Fusion Workshop

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GAIN
Gateway for Accelerated Innovation in Nuclear

INL/MIS-18-50189

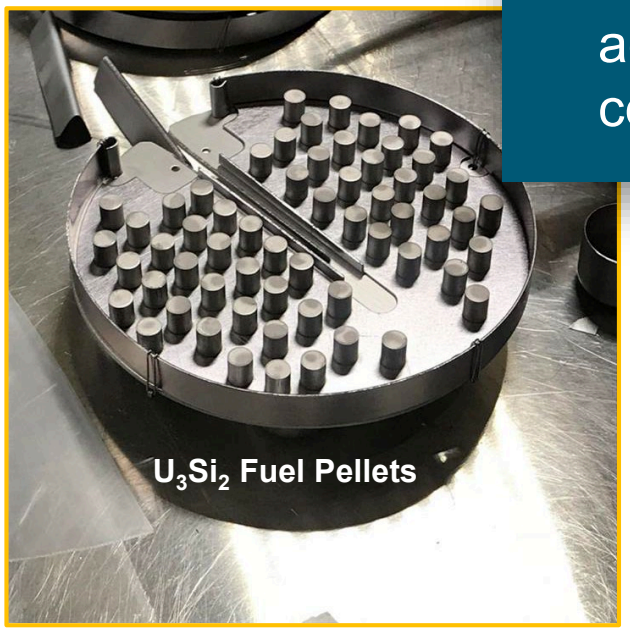
Vision and Mission

Vision (2030)

The U.S. nuclear industry is equipped to lead the world in development of innovative nuclear technologies to supply urgently needed abundant clean energy, both domestically and globally.

Mission

Provide the nuclear energy industry with access to the technical, regulatory, and financial support necessary to move innovative nuclear energy technologies toward *commercialization* in an accelerated and cost-effective fashion.



New accident tolerant fuel (ATF) U_3Si_2 fuel: Fabricated at INL (Fall 2018) and delivered to Westinghouse's Columbia Fuel Fab Facility for loading into Encore™ Lead Test Assembly (LTA). Shipped to Exelon's Byron Generating Station and installed in Unit 2 (April 2019).

What is the GAIN Initiative?
Gateway for Accelerated Innovation in Nuclear

What are the issues?

- Time to market is too long
- Facilities needed for RD&D are expensive
- Capabilities at government sites have not been easily accessible
- Technology readiness levels vary
- Some innovators require assistance with regulatory processes

What do we need to do?

- Provide nuclear innovators, **suppliers,** and investors with single point of access into DOE complex
- Provide focused research opportunities and dedicated industry engagement
- Remove barriers and make connections
- Accelerate joint work with NRC for advanced reactor licensing

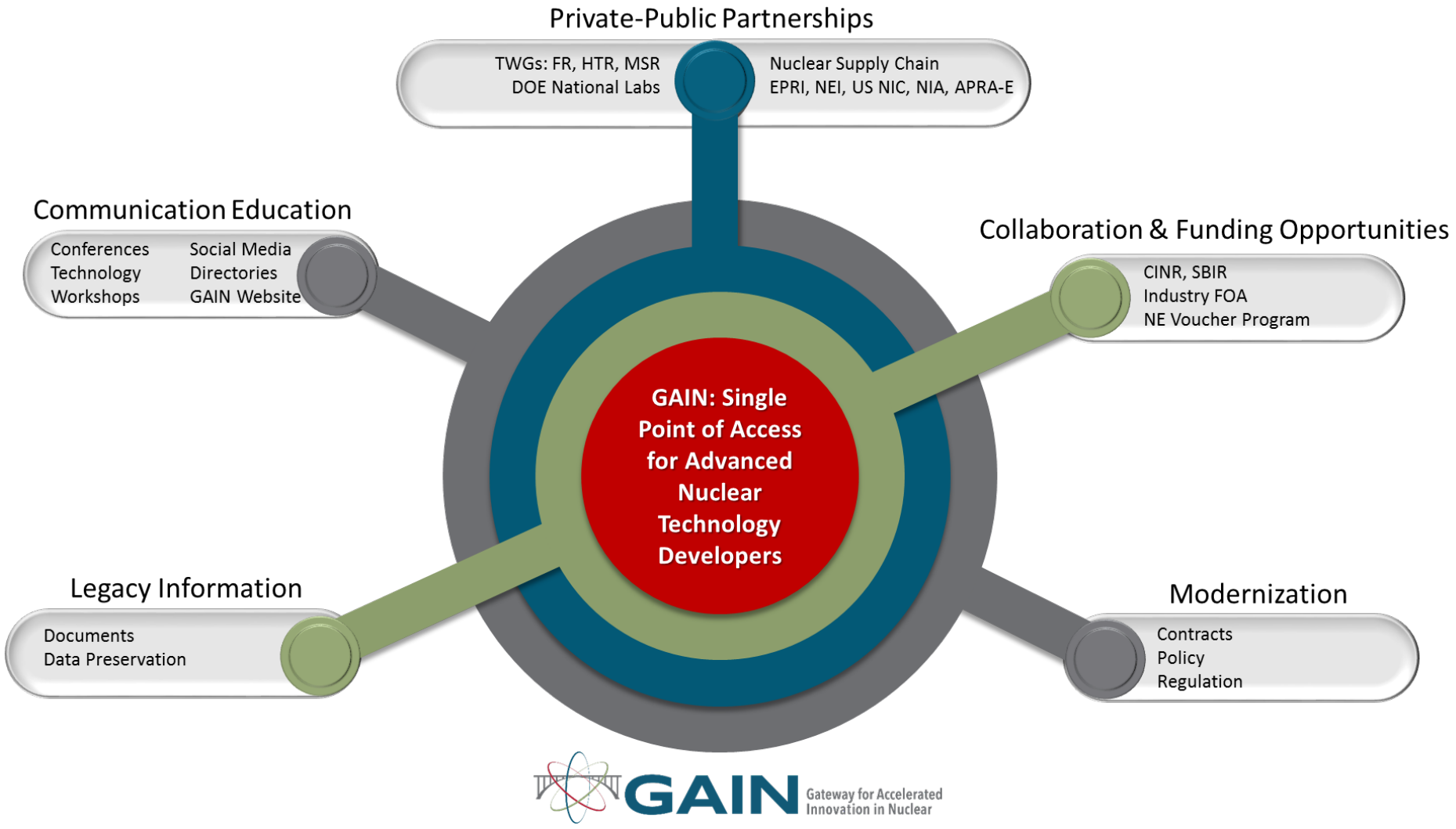
What is the GAIN initiative?

- **A private-public partnership framework dedicated to rapid and cost-effective development of innovative nuclear energy technologies toward market readiness**

DOE recognizes the magnitude of the need, the associated sense of urgency and the benefits of a strong and agile private-public partnership in achieving the national leadership goals.

GAIN at a High Level

- DOE-NE is committed to utilizing its resources to enable the U.S. nuclear industry on behalf of the public.
  - **GAIN represents the implementation of this commitment**
  - GAIN informs NE programs and enables them to support the vision of DOE-NE
    - Focused technology workshops
    - Industry centric conferences and interactions
  - GAIN acts as an advocate to DOE-NE (and hence the programs) for the U.S. nuclear industry
  - GAIN facilitates industry access to the unique capability at the National Laboratories
  - GAIN addresses emerging industry issues (evolution is expected)
  - GAIN seeks to improve legacy DOE/laboratory processes to enable efficient industry collaboration (contracting, legacy data/documents, etc.)


Private-Public Partnerships
TWGs: FR, HTR, MSR
DOE National Labs
Nuclear Supply Chain
EPRI, NEI, US NIC, NIA, APRA-E
Communication Education
Conferences
Technology
Workshops
Social Media
Directories
GAIN Website
Collaboration & Funding Opportunities
CINR, SBIR
Industry FOA
NE Voucher Program
GAIN: Single Point of Access for Advanced Nuclear Technology Developers
Legacy Information
Documents
Data Preservation
Modernization
Contracts
Policy
Regulation
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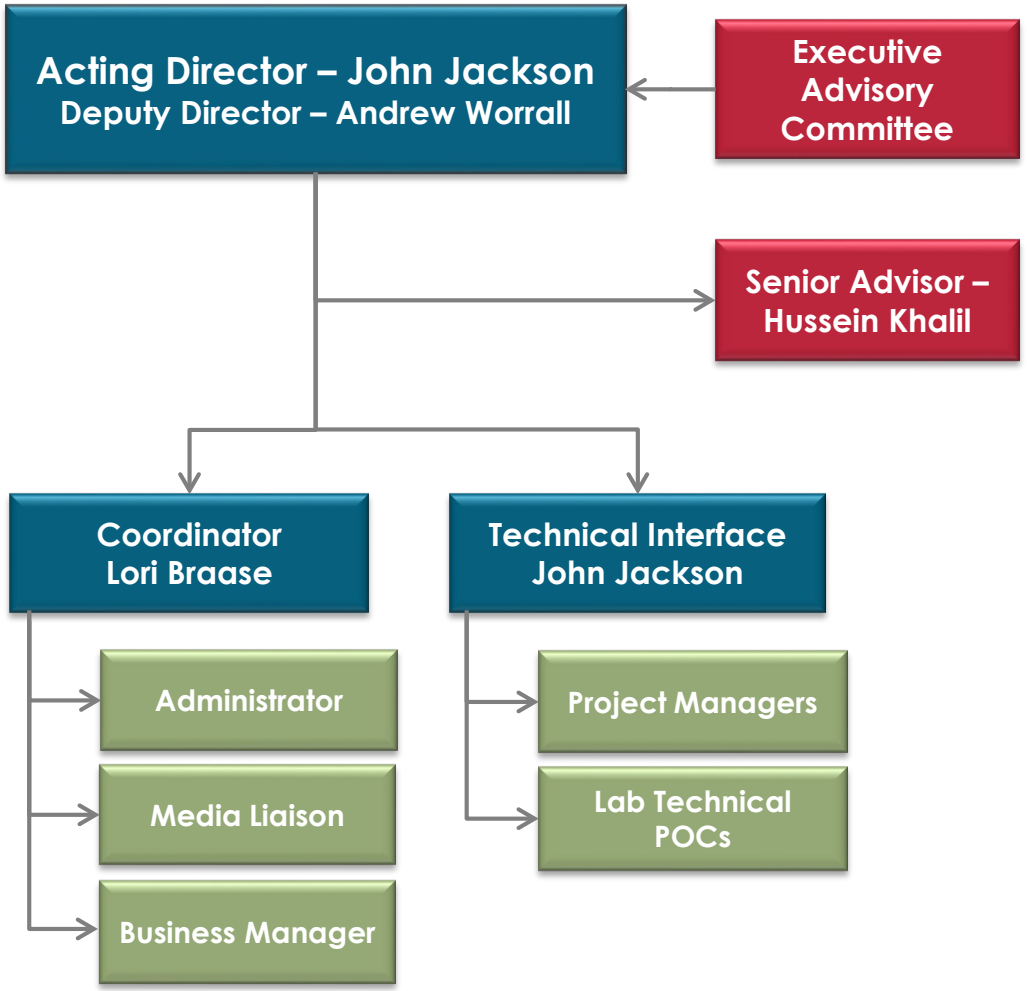
GAIN Organization



Neil Wilmshurst, EPRI – Chair
Nick Irvin, Southern Company
Paul Kearns, ANL
Dale Klein, University of Texas
Maria Korsnick, NEI
Jeff Merrifield, USNIC
Chris Mowry, NIA
Mark Peters, INL
Ray Rothrock, Partner Emeritus Venrock
Thomas Zacharia, ORNL

What are GAIN NE Vouchers?

- Competitively awarded access to facilities and staff in the DOE national laboratory complex – **not a financial award**. Funds go directly to lab to perform work.
  - Access to capability that isn't available in the private sector
  - Awardee directs work through interaction with lab staff
- Opportunity for industry to work with the laboratories and establish relationships
- Tangible advancement of innovative technologies toward market readiness
- Available to businesses that are majority (51% or greater) U.S. owned and established in the U.S.
  - No size restriction on companies – small businesses receive extra consideration
  - Foreign affiliation will involve extra review

NE Vouchers – what we're looking for

- Proposed work
  - Accelerates/enables commercialization of an innovative technology
  - Makes use of unique DOE laboratory capability
  - Promotes private-public partnerships (builds relationships)
  - Leverages additional company investment (cost share)
- Problems must be defined by industry (not laboratory initiated!)
- Work scope is clear, feasible in ~1year, and aligns with laboratory capability
- Overall impact of underlying technology accelerates deployment of new nuclear or improves viability of existing plants
- No sustained, fundamental R&D
- **Does not replace or supplement DOE-NE Programmatic work**

GAIN Voucher Program – Process Flow

(June 2019)

WEEKS

1 | 2 | 3 | 4 | 5 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 26 | 27 | 80

Idea formulated

Company identifies POC and laboratory

Company does not identify POC and laboratory

GAIN verifies the lab facility and resources are available

GAIN determines where capability exists and connects the applicant to it

Applications received & GAIN review commences

GAIN review team makes initial recommendation

DOE-NE makes final decision

Awards announced

GAIN ensures contact is made between applicant & POC

POC & applicant work to determine/clarify SOW, cost estimates, & schedule

Acquisition & Contract Management (A&CM) initiates contracting mechanisms

AC&M finalizes CRADA

DOE site office reviews and approves

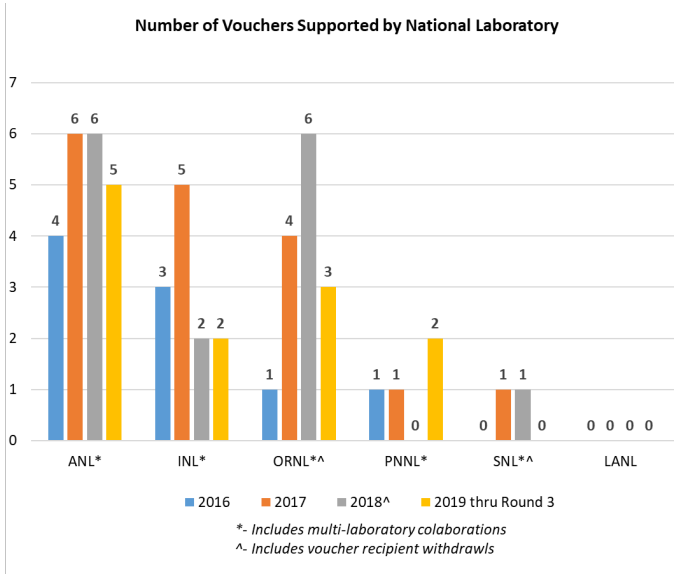
DOE transfers Funds to the INL or other sites

AC&M informs the PI that work is approved; PI contacts the applicant to begin work

Start work

Lab POC provides final report to awardee and summary to GAIN

Validation & closeout survey



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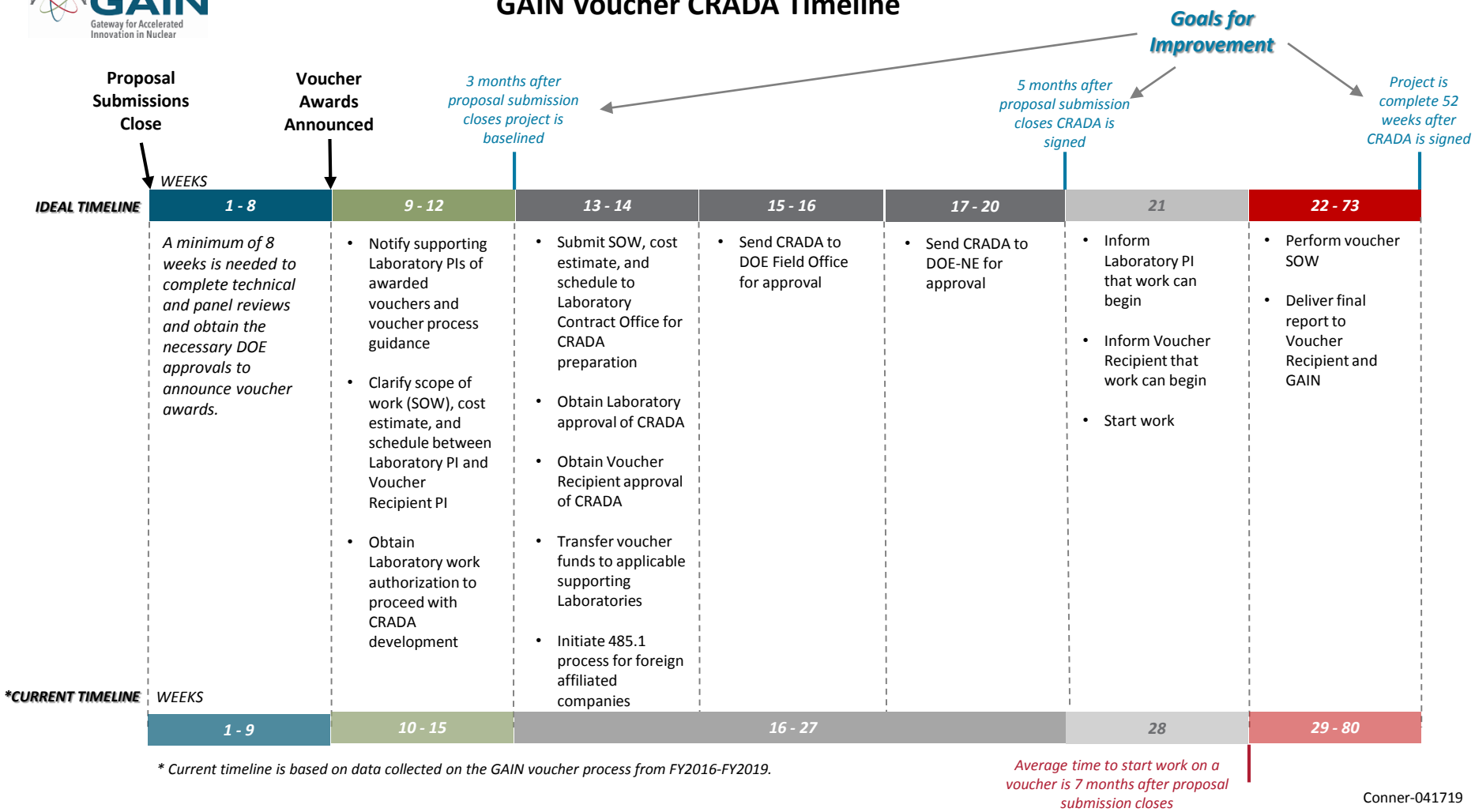
GAIN Voucher CRADA Timeline



** Current timeline is based on data collected on the GAIN voucher process from FY2016-FY2019.*

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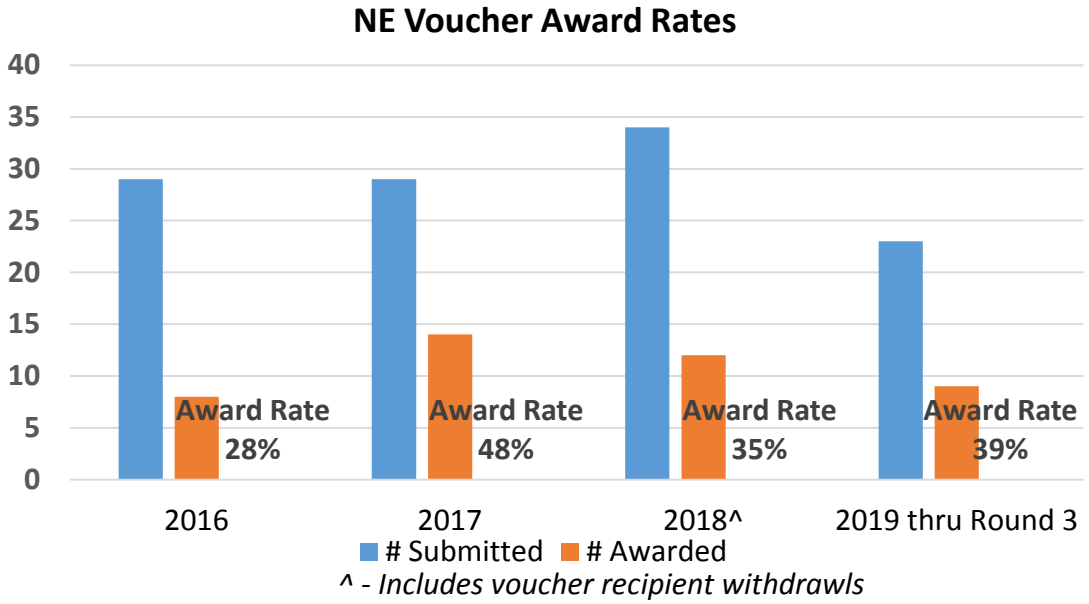
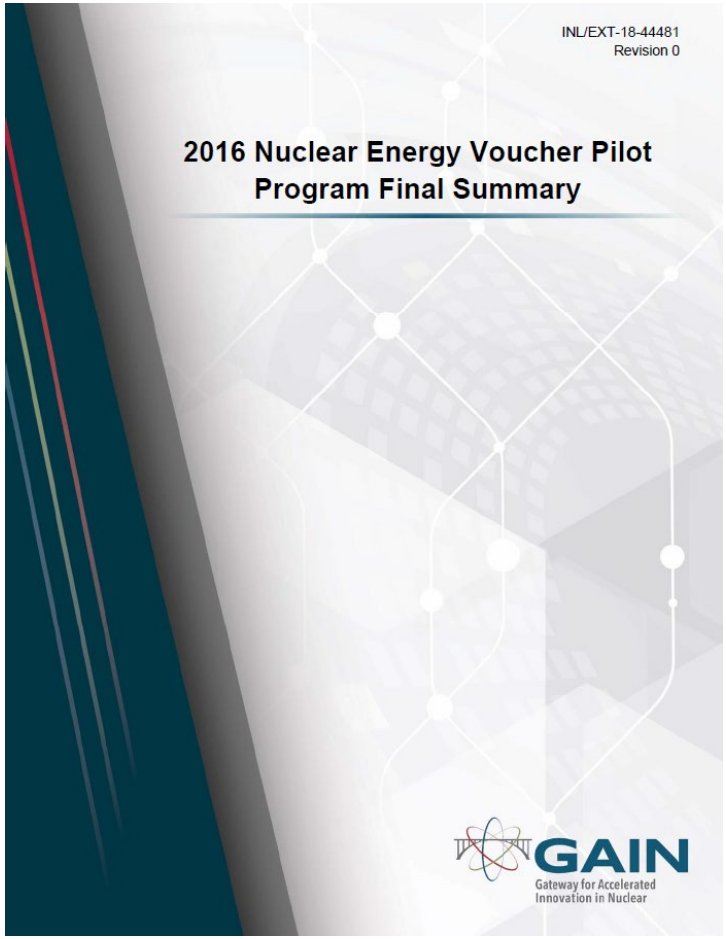
Some statistics (so far)



- 20 Vouchers completed so far
- 43 awarded
- ~$17.3M in funds to laboratories



Voucher Award Breakdown by Recipient (does not include Company Cost Share)

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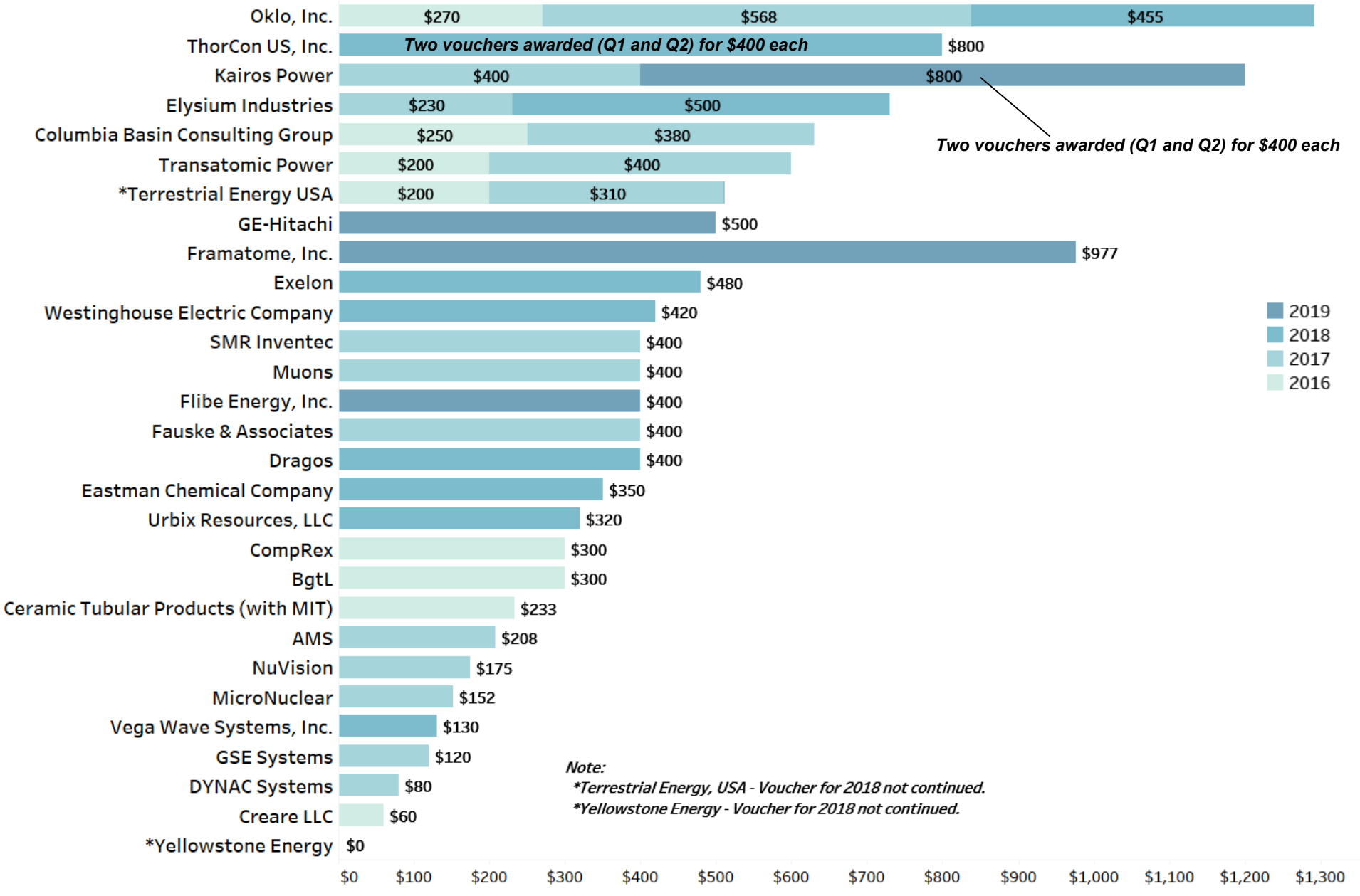
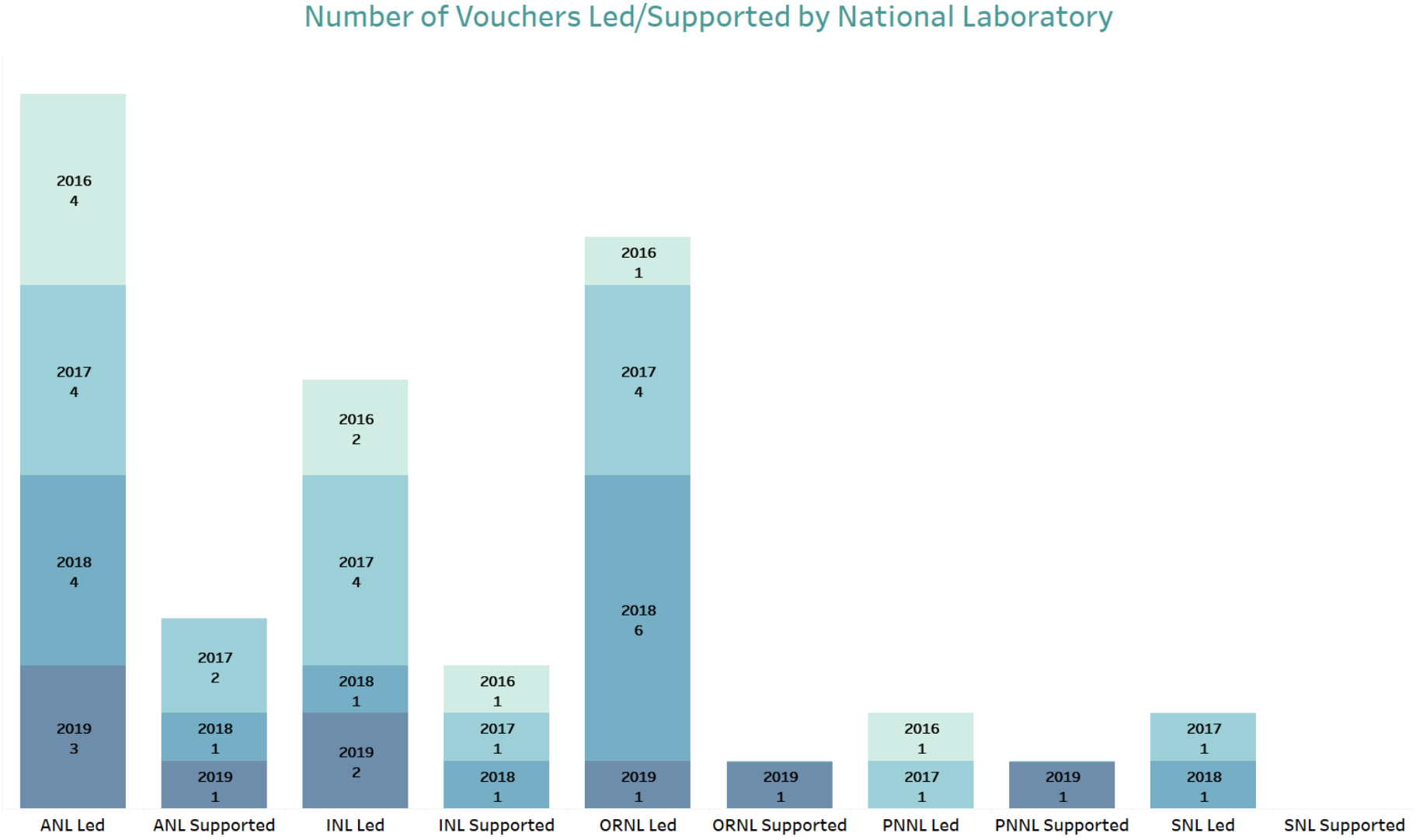


Note:
**Terrestrial Energy, USA - Voucher for 2018 not continued.*
**Yellowstone Energy - Voucher for 2018 not continued.*

GAIN's Impact on Laboratories through vouchers



- More responsive to industry requests
- Improved how labs operate; heightened awareness to customer service
- Increased investor interest in laboratory activities.

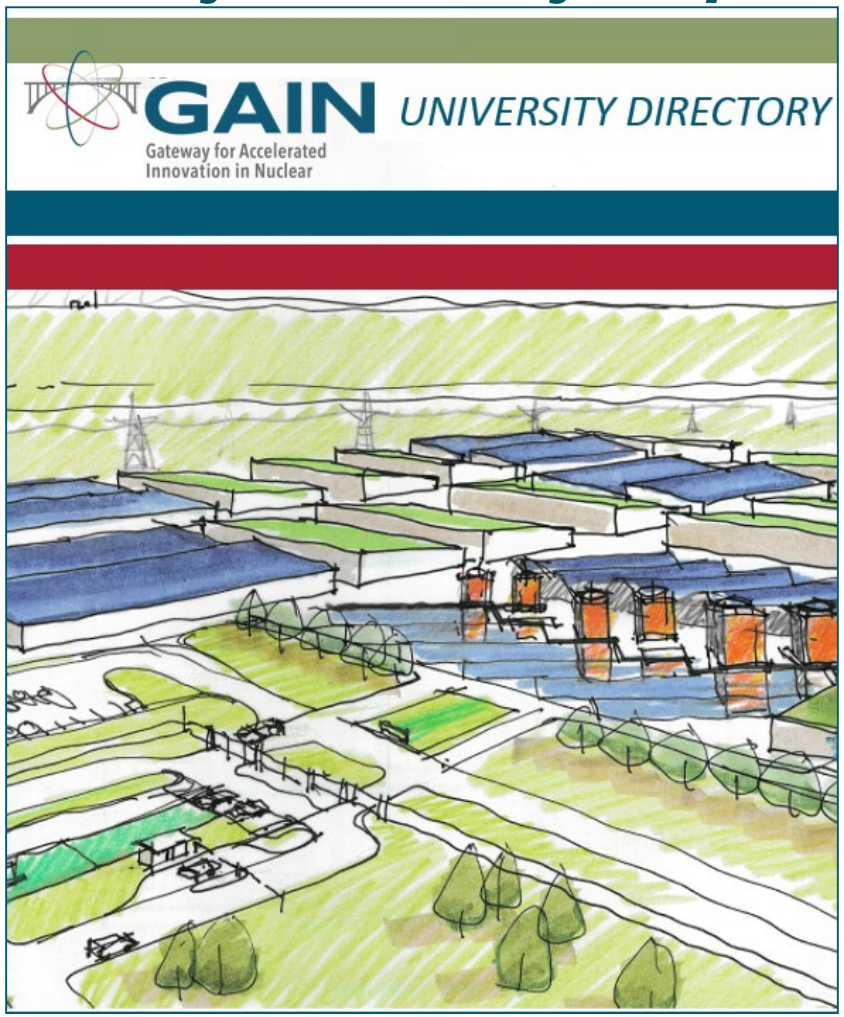
FY-19 Round 1: GAIN NE-Voucher Awardees

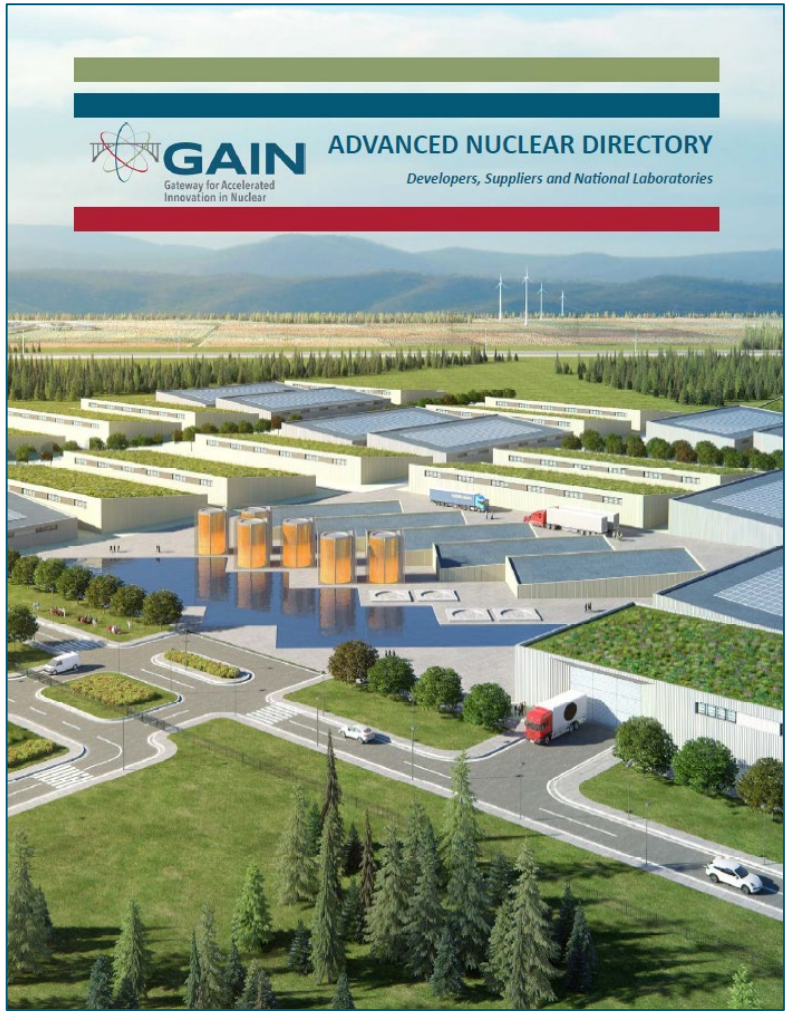
2019 Round 1 GAIN Voucher Recipient	Awarded Proposal	Partner Facility
GE-Hitachi Wilmington, NC	Enabling System Technologies to Improve the Economics and Performance of Existing LWRs and Advanced BWR Plants: Improving Off-gas System Performance	Idaho National Lab
Framatome, USA Lynchburg, VA	Advanced Fuel Stability Analysis Using High-Fidelity Large Scale Computational Fluid Dynamic Simulations	Argonne National Lab
Kairos Power Alameda, CA	Chemical Method Development for Quantifying Oxygen in Beryllium Salts	Argonne National Lab, Oak Ridge National Lab

FY-19 Round 2: GAIN NE-Voucher Awardees

2019 Round 2 GAIN Voucher Recipient	Awarded Proposal	Partner Facility
Flibe Energy, Inc. Madison, Alabama	LFTR Preliminary Safeguards Assessment	Oak Ridge National Laboratory
Framatome USA Lynchburg, Virginia	Advanced Metallic U-Zr Fuel for LWR Applications – FMEA and PIRT Development	Idaho National Laboratory
Kairos Power Alameda, CA	Develop ASME Section III Division 5 design rules for elevated temperature cladded Class A Type 316 stainless steel components	Argonne National Laboratory

New University Directory / Updated Advanced Nuclear Directory





GAIN Highlights for FY2019 (so far)

- Atomic Wings Panel: Public- Private Partnerships
- NRC concurrence on performance-based “functional containment” for advanced reactors
- Implemented "walk-in work” per EAC recommendation
- Outreach to INL, LLNL, SNL and LANL
- Awarded nine GAIN vouchers in three rounds
- Refined and accelerated the process for GAIN voucher review, award, and kickoff
- Developed the pilot process for review and release of legacy documents
- Initiated the GAIN University Directory
- Led six industry workshops
  - NSUF Industry Advisory Meeting
  - Molten Salt Reactor Workshop
  - Advanced Manufacturing for Nuclear
  - EPRI Construction Economics
  - Advanced Fuels Workshop
  - Micro-Reactor Workshop