GAIN
Gateway for Accelerated Innovation in Nuclear

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ASI Webinar

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INL
Idaho National Laboratory

Oak Ridge National Laboratory

Argonne NATIONAL LABORATORY

INL/MIS-18-50189

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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?

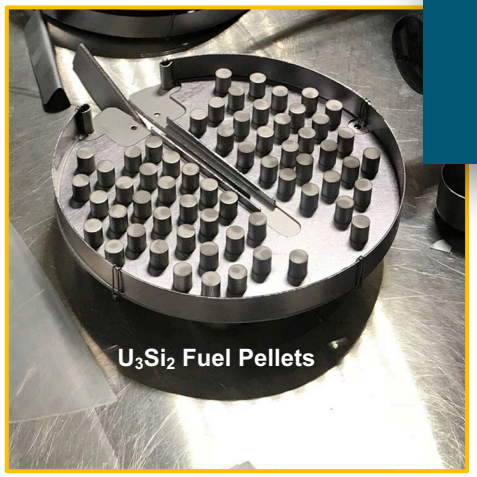
- **A private-public partnership framework dedicated to rapid and cost-effective development of innovative nuclear energy technologies toward market readiness**

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.

Vision and Mission

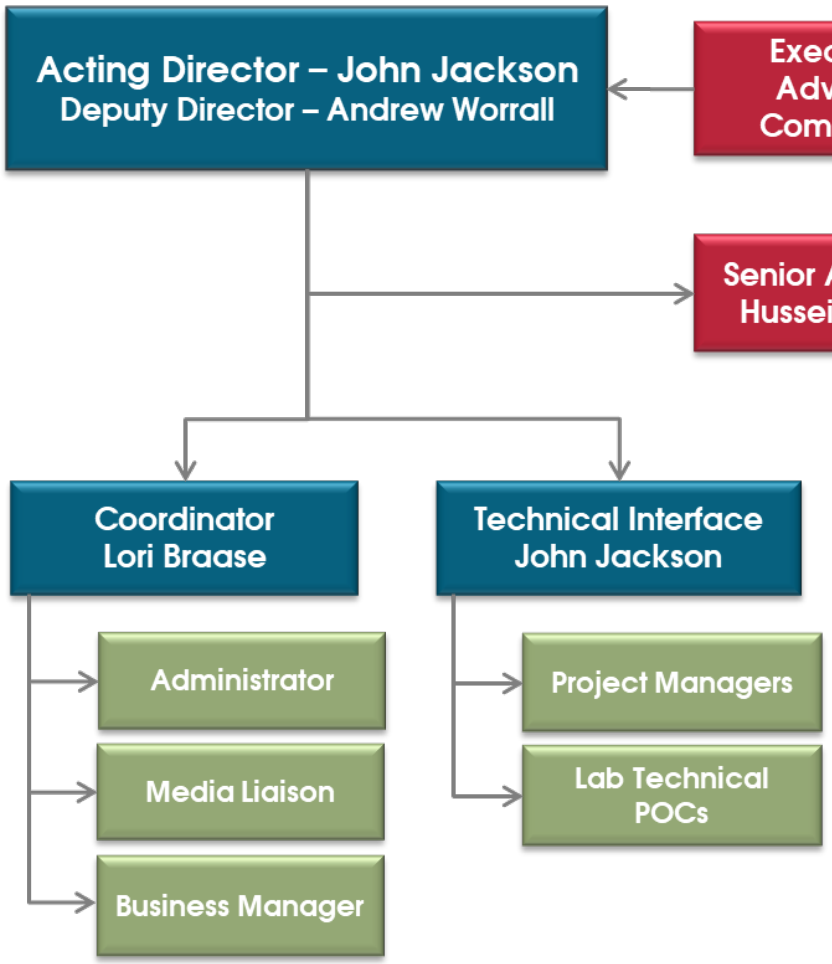
Vision (2030)
The U.S. nuclear industry is equipped to lead the world in development of innovative nuclear technologies to supply urgently needed abundant clean energy, both domestically and globally.

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).

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

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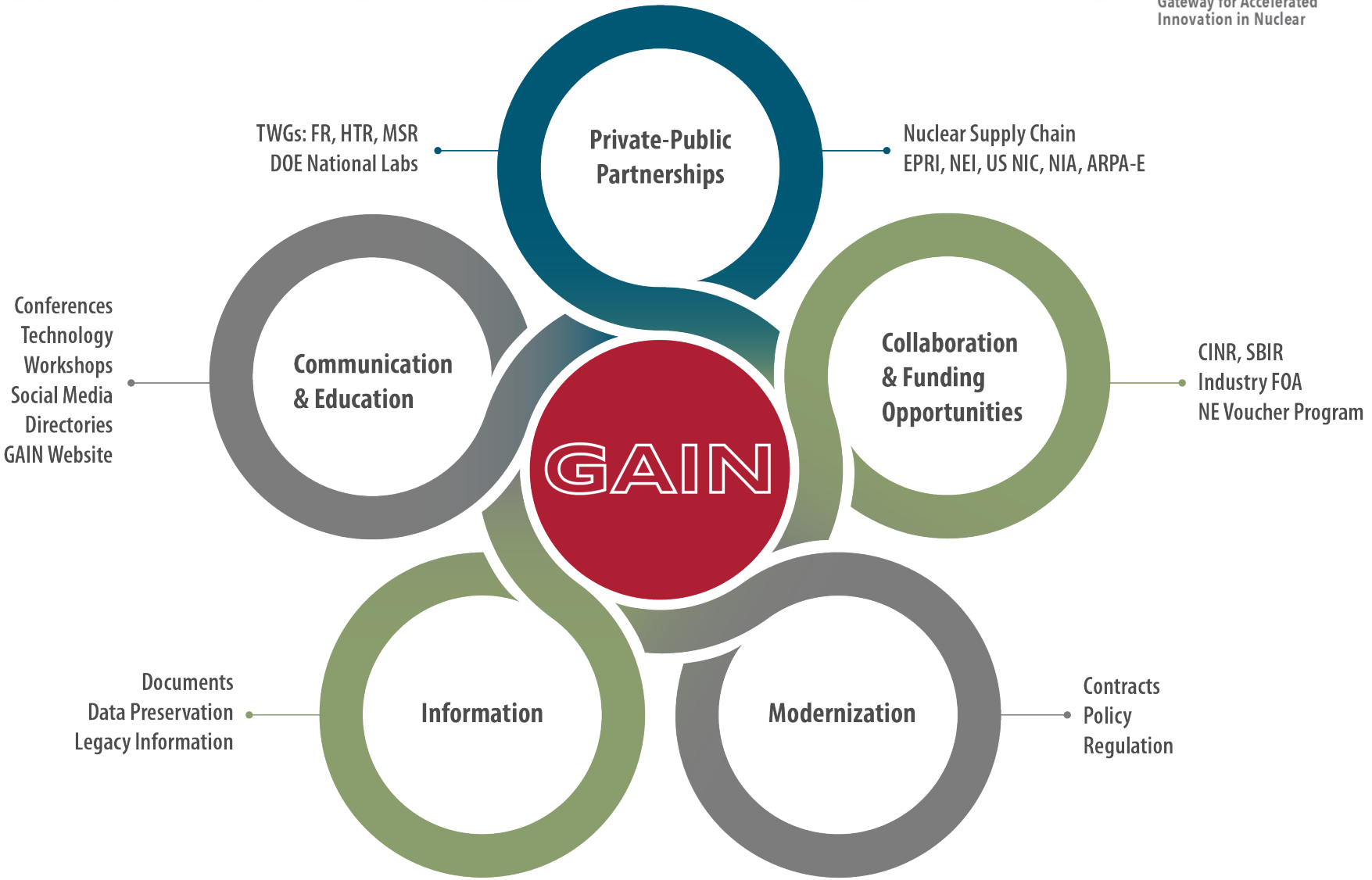

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GAIN: Connecting nuclear innovators to DOE laboratory capabilities and RD&D programs

Modeling & Simulation	Crosscutting Design Support	NRC Interface	Base Reactor and Fuel Cycle R&D Programs	Experimentation
HPC Infrastructure	Nuclear Hybrid Energy	Licensing Framework	Advanced Fuel Cycles	Nuclear Fuels
Verification and Validation	Nuclear Cyber Security	Gradual Risk Reduction	Advanced Reactors	Instrumentation and Sensors
M&S Expertise	Digital I&C Human Factors	Licensing Support Expertise	LW-based Reactors	Materials Science
Reactor physics				Test Reactors

Modeling and Simulation | **Expertise** | **Unique Facilities**

Knowledge Management & Integration

– GAIN –

Industry and investor access to DOE capabilities and expertise

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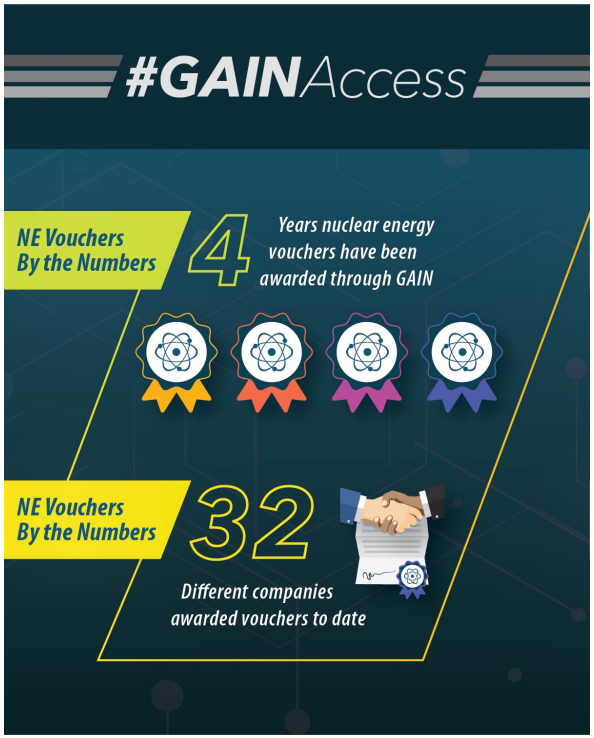

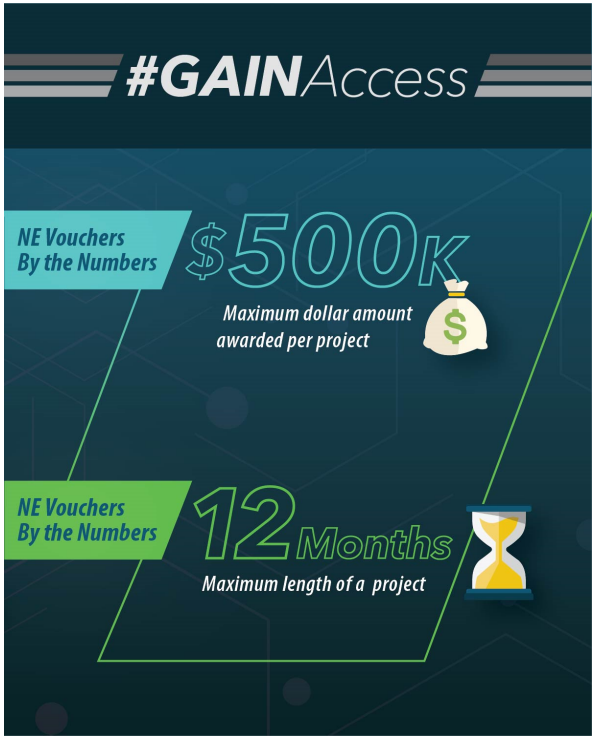

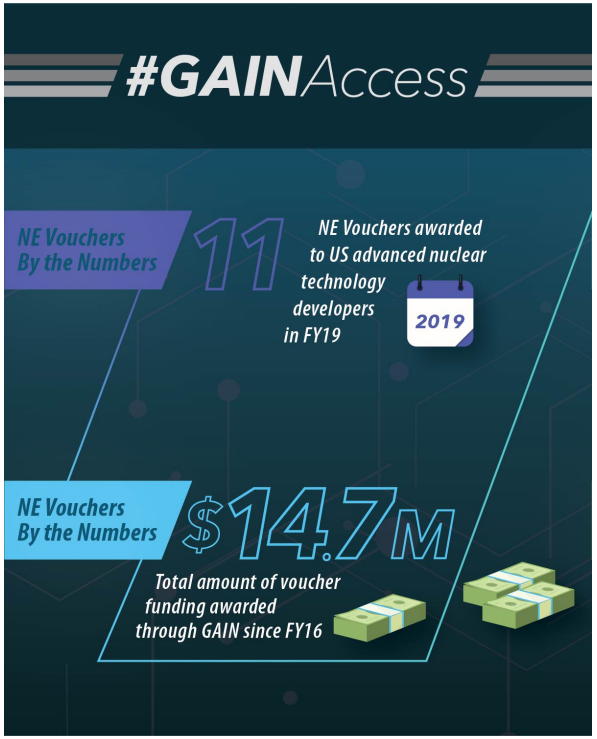

GAIN NE Voucher Program is one way to provide industry with access to the unique research capabilities and expertise at DOE's National Labs

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How to do Business with GAIN

- Provides *Contract Mechanisms* on one side and *Funding Opportunities* on the other
- Information applies to all the DOE national labs in their contracting discussions with industry
- Available on the GAIN website since March 2019

How to do Business through GAIN

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Funding Opportunities

Funding Opportunities	Description	Timeframe	Funding*
Advanced Nuclear Technology Development (iFOA)	Provides funding to support innovative, domestic, nuclear industry-driven designs and technologies that have high potential to improve the overall economic outlook for nuclear power in the U.S. The iFOA is comprised of three tiers focused on first-of-a-kind demonstration, advanced reactor development, and regulatory support. gain.inl.gov	Continuously open Award: Quarterly Duration: up to 3 years	Tier 1: $10-40M Tier 2: $0.5-10M Tier 3: $50K-0.5M (Tiered cost share)
Consolidated Innovative Nuclear Research (CINR)	Provides competitively awarded access to the Nuclear Science User Facilities (NSUF) by industry for non-proprietary nuclear materials and fuels research. CINR is the primary means to award irradiation and post-irradiation examination (PIE) access. It also supports DOE-NE mission and program directed work scopes primarily led by universities or national labs with the possibility of industry participation. gain.inl.gov	Call: August Award: July Duration: up to 3 years for R&D; up to 7 years for PIE and testing	Up to $500K for R&D Up to $4M for irradiation and PIE (NSUF) (0% cost share)
GAIN Nuclear Energy (NE) Vouchers	Provides competitively awarded access to DOE national labs for U.S. businesses to tap into the intellectual and technical resources needed to overcome critical technology challenges for their advanced energy products and gain a global competitive advantage. Awarded funds are sent directly to a national laboratory to perform work on behalf of an awardee. gain.inl.gov	Continuously open Award: Quarterly Duration: 12 months	$50–500k (20% cost share)
NSUF Rapid Turnaround Experiments (RTE)	Offers an avenue for researchers to perform irradiation effects studies of limited scope on nuclear fuels and materials of interest utilizing NSUF facilities. R&D funding is not provided, and work is to be completed within 9 months. nsuf.inl.gov/Page/rte	3 times per year Duration: 9 months	Up to $50K (0% cost share)
Small Business Innovation Research (SBIR)	Offers competitively awarded funding to small businesses to encourage development and commercialization of their technologies. SBIR targets the entrepreneurial sector and seeks to offset the risk and expense of necessary R&D. SBIR is comprised of three phases, each contingent on building from the results of the previous phase. science.energy.gov/sbir/funding-opportunities/	Phase 1: 6 months Phase 2: 2 years Phase 3: Refer to website	Phase 1: up to $150K Phase 2: up to $1M Phase 3: 50 SBIR Funds (Refer to website)
Technology Commercialization Fund (TCF)	Seeks commercialization of laboratory technology with industry partners. Leverages R&D funding in applied energy programs to mature promising energy technologies that are originally conceived at national laboratories with the potential for high impact. gain.inl.gov	Call: February Award: July Duration: 1-2 years	Topic 1: $100 - 150K Topic 2: $250 - 750K (Refer to website)

*Contingent upon Congressional appropriations. Note: DOE National Laboratory (lab)

Contact gain.inl.gov for additional information. 3/11/19

How to do Business through GAIN

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Contract Mechanisms

Agreement	Description	Highlights
DOE Cooperative Agreement	A contract that is signed by DOE and an industry awardee to perform work at the Awardee's facilities and/or national lab. This is the mechanism used by DOE to fund awards made through the **IFOA**.	• Allows DOE to fund competitively awarded research directly.
Cooperative Research and Development Agreement (CRADA)	DOE lab partnering with one or more non-federal entities (including industry) that facilitates private sector research utilizing, for example, lab technologies, facilities, R&D capabilities, or expertise. The CRADA participant must contribute in-kind resources (personnel, equipment, facilities, etc.), and/or cash. A funding source for the lab work must be identified before work can start; this may be either participant funds, federal funds, or a combination. Commonly used for **GAIN NE Voucher** awardees who are large businesses or foreign influenced. Terms and conditions are non-negotiable.	• Up to 5 years of data protection. • Both parties may take title to their own inventions. • May negotiate exclusive license to inventions. • Advance payment required if participant is contributing funds to lab.
GAIN Small Business Voucher CRADA	Used ***exclusively*** for a **GAIN NE Voucher** awarded to a small business/non-profit voucher requester with NO foreign ownership/control/influence. Terms and conditions foster commercialization and are non-negotiable. This CRADA is intended to speed up the process of signing an agreement to complete awarded GAIN NE Voucher work.	• In addition to standard CRADA terms, provides the participant a nonexclusive license, at a minimum, to inventions conceived or first reduced to practice under the CRADA.
Nondisclosure Agreement (NDA)	Establishes the obligations regarding the exchange of proprietary or confidential business information between a DOE lab and an industry entity in order to allow them to progress toward a specific objective, commonly a contract under which work may be performed.	• Enables business relationships to develop work scope for joint projects.
Strategic Partnership Project (SPP) (Work for Others)	This is a fee-for-service contract that enables industry, non-profit institutions, and other non-federal entities to pay labs to perform a defined scope of work or tasks. Work must draw upon the unique facilities, equipment, or personnel intrinsic to the lab. The rights to the inventions and data (subject inventions) may vest in the sponsor if the sponsor is a U.S. entity and pays for the work with private funds; however, if the sponsor is providing federal funds to the lab to support the work (typically received through a competitive process) or if the sponsor is a non-U.S. entity or has foreign influence, then the rights of subject inventions will vest with the lab performing the work with no rights for protection of generated data.	• Generated data may be designated as proprietary. • Sponsor typically retains right to elect title to subject inventions. • Advance payment required.
User Facility Agreement	A User Facility Agreement provides access to facilities to conduct research. It may be possible to perform proprietary or non-proprietary (e.g., **NSUF**) research at the designated user facilities. In certain circumstances, access to facilities is available to U.S. companies on a full cost recovery basis. Access generally begins with an invitation from an employee or through submission and approval of a peer-reviewed proposal.	• IP belongs to inventor/company. • No charge for users who are performing non-proprietary research. • Non-proprietary users are expected to publish results.

Contact gain.inl.gov for additional information. 3/11/19

Legacy Documents / Industry Access

Initial **Fast Reactor (FR) Technology List** provides access to 4250 openly published FR documents available from OSTI (December 2018)
Initial **Molten Salt Reactor (MSR) Technology** List provides access to 210 cataloged MSR documents available on OSTI (February 2017)
OSTI Spreadsheet of 12,000 Applied Technology (AT) Documents with abstracts provided to GAIN. List released with abstracts on February 28, 2019. Provided to TWG Chairs on March 8
New Production Reactor (NPR) 121 boxes were recently found in storage. They will be evaluated for applicability, scanned, reviewed, and relocated to OSTI in FY 2020.
Clinch River Breeder Reactor (CRBR) Documents at TVA, TN. INL-Iron Mountain contract signed Sept. 30, 2019. Iron Mountain is proceeding with the task to scan 235 boxes + 75 reels of microfilm.
LOFT and other LWR Experiments. Fauske and Associates completed a pilot knowledge preservation activity in FY 2020.
Transatomic Power Corporation open source documents on GAIN website (December 2018)
Loft Experiment Data for code validation (Box of data –INL – to be scanned & reviewed. **PBF Documents** (3 boxes at INL) will be scanned and reviewed.

Databases of Experimental Information

Database	Lab	Status
TREXR TREAT Experiment Relational Database	ANL	https://www.trexr.anl.gov/ External access available by application.*
NaSCoRD Sodium System & Component Reliability Database	SNL	https://www.sandia.gov/nascord/ External access. Phase II Complete in FY-20.*
ETTD EBR-II Transient Testing Database	ANL	https://ettd.ne.anl.gov/ External access available by application.
FIPD EBR-II Metallic Fuel Irradiation Database	ANL	https://fipd.ne.anl.gov/ Complete in 2019*
FFTF Safety Testing Database	PNNL	Complete in FY-20.*
FFTF Metallic Fuel Irradiation Database	PNNL	
OPTD Out of Pile Transient Testing Database	ANL	https://optd.ne.anl.gov/ Complete in 2019.*
EBR-II and FFTF Fuel Experiment PIE Database	INL / ANL	Designed for modeling ease of use – INL LDRD funding effort. Complete in 2021.
Nuclear Materials Database	LANL	Concept only

**Partially funded by GAIN in coordination with applicable programs. All databases will have links available at gain.inl.gov*

GAIN Workshops

Organized, executed, and/or supported eight industry workshops in FY 2019

NSUF Industry Advisory Meeting	Sep. 2018
Molten Salt Reactor Workshop	Oct. 2018
Advanced Manufacturing for Nuclear	Dec. 2018
Plant Construction Economics (EPRI)	Jan. 2019
Advanced Fuels Workshop	Mar. 2019
Micro-Reactor Workshop	Jun. 2019
Fast Reactor Workshop	Jul. 2019
Atomic Week (Generation Atomic)	Aug. 2019

Since January 2016, GAIN has engaged and impacted many organizations through our workshops, directories, vouchers, and DOE industry FOAs:

- Individual Companies (industry) – 198
- Universities, government agencies, etc. – 79

GAIN-EPRI-NEI Sensor Technologies for Advanced Reactors Workshop

- **Purpose:** GAIN, EPRI, NEI workshop to exchange information among advanced nuclear technology developers, commercial instrument suppliers, and sensor researchers from DOE national laboratories, universities, and industry
- **Objectives:**
  - Identify measurement requirements and needs for advanced reactor concepts: (HTRs, FRs, MSRs)
  - Create phased development approach for sensors with demonstration experiments and related facilities (irradiation test, single effect test, advanced operation modes) as near-term targets
  - Understand current national laboratory capability and identify gaps to inform applicable DOE research programs
- **Date/Location:** June 30-July1, 2020 – INL, Idaho Falls, ID

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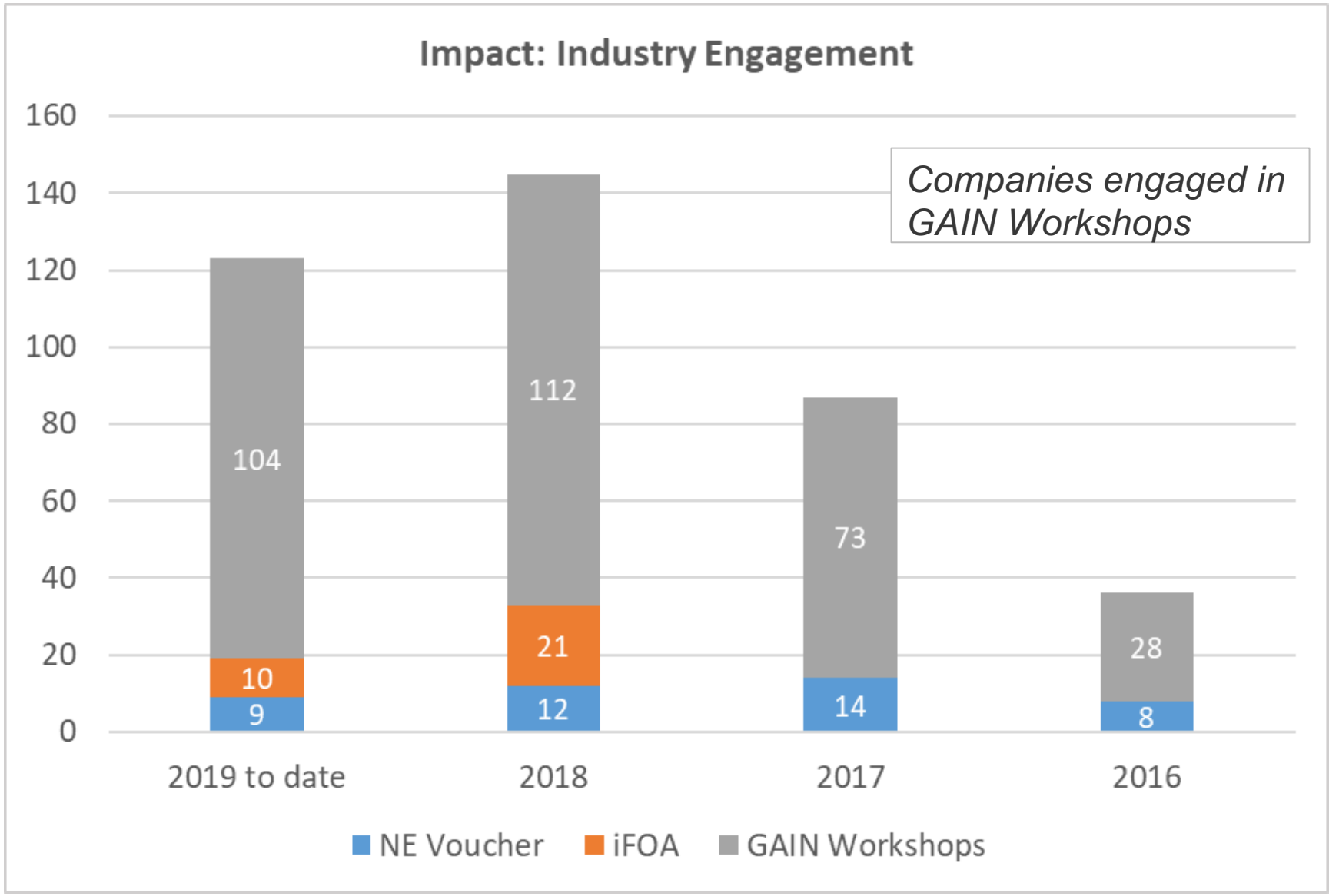
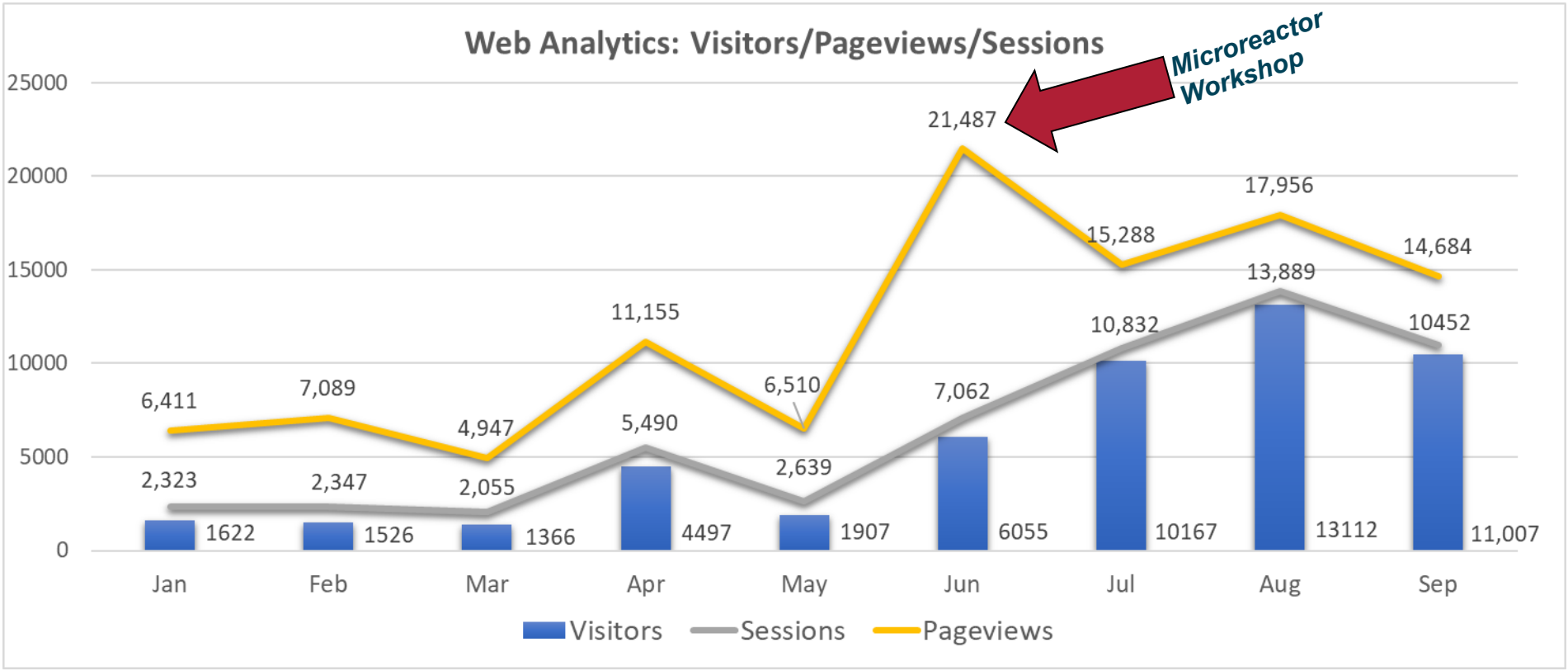


Impact of GAIN's Website



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GAIN Social Media – September 2019

942 Facebook Followers

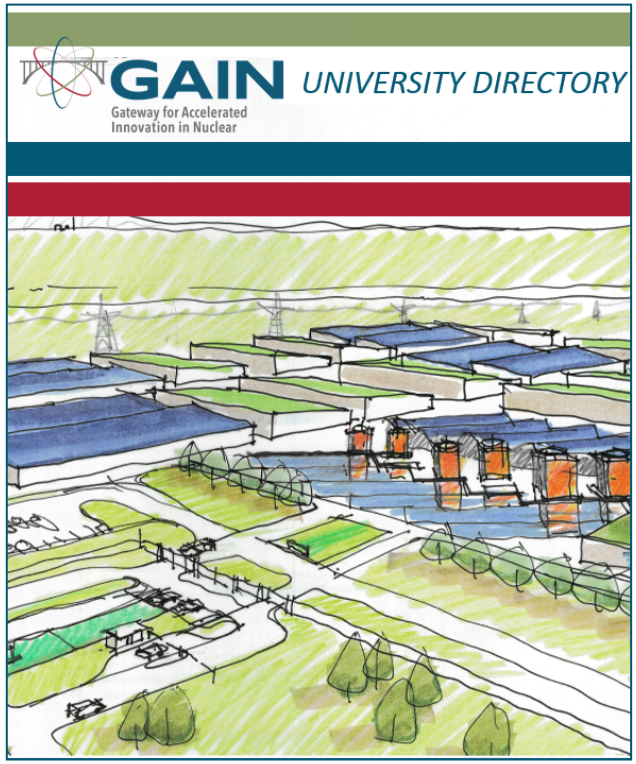
1,848 Facebook Reach

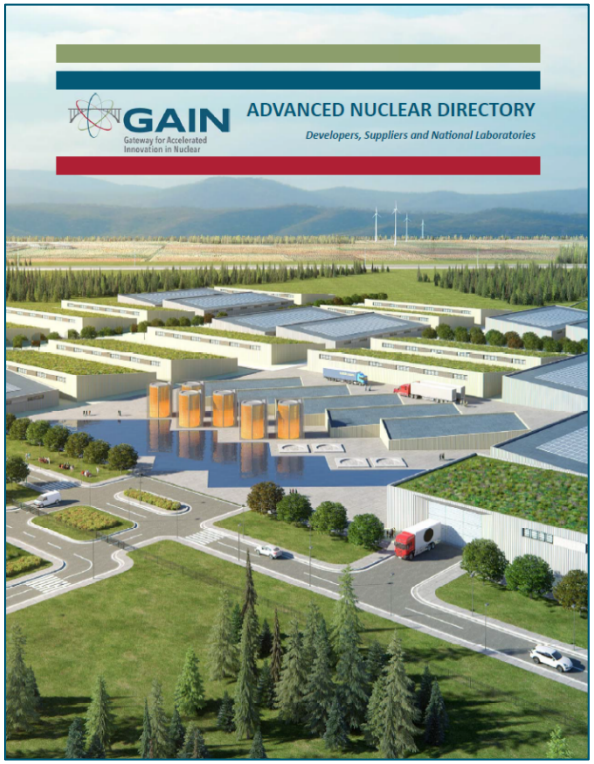
1,817 Twitter Followers

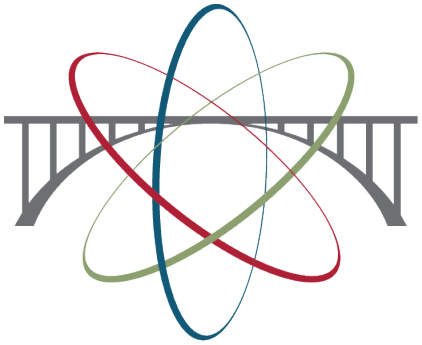
23.8K Twitter Impressions

236 Instagram Followers

New University Directory / Updated Advanced Nuclear Directory







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