

# ***GAIN Nuclear Energy Voucher Program***

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## ***Mission and Vision***

### **Vision (2030)**

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



World Nuclear  
Energy Day

### **Mission**

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



# GAIN Mission-Driven Goals

*GAIN: small enough to be nimble, big enough to be relevant*



1. Provide private entities access to financial support opportunities and national laboratory capabilities (facilities, expertise, and tools)
2. Identify gaps, gather needs, and develop viable paths forward to inform DOE research programs.
3. Enable the completion of key portions of a modernized risk-informed regulatory framework.
4. Engage with non-nuclear audience to introduce nuclear energy to help investigate potential applications using national lab capabilities (expertise and tools) and federal funding opportunities.
5. Contribute tailored, factual information to key stakeholders to motivate the integration of nuclear energy into state, regional and local plans.

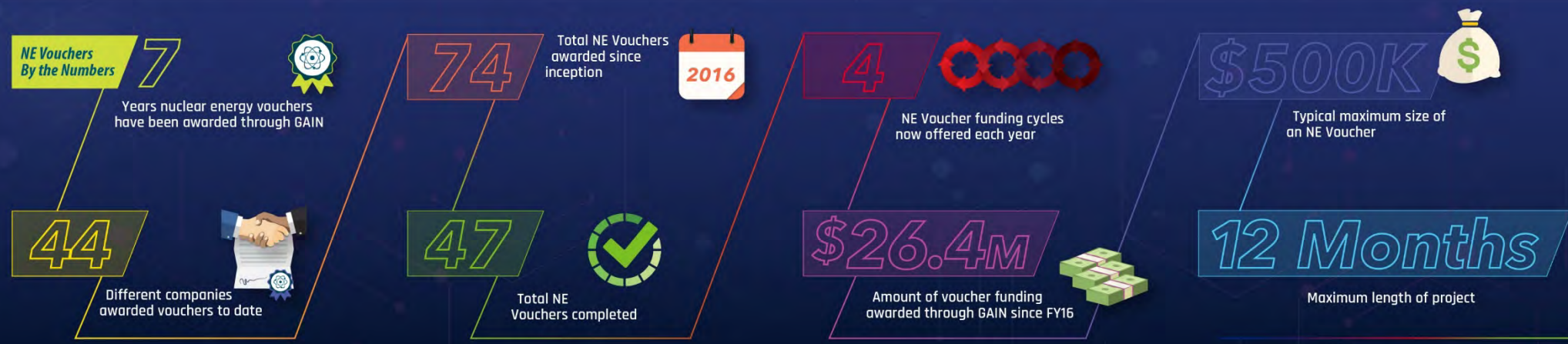
# GAIN Vouchers

- GAIN Vouchers started in 2016
- Since Inception
  - 74 vouchers awarded - 47 completed - 44 different companies
  - \$26.4M awarded to date
- GAIN Vouchers are open to support multiple areas for advanced nuclear technology developers.

#GAINAccess #GAINAccess #GAINAccess #GAINAccess #GAINAccess

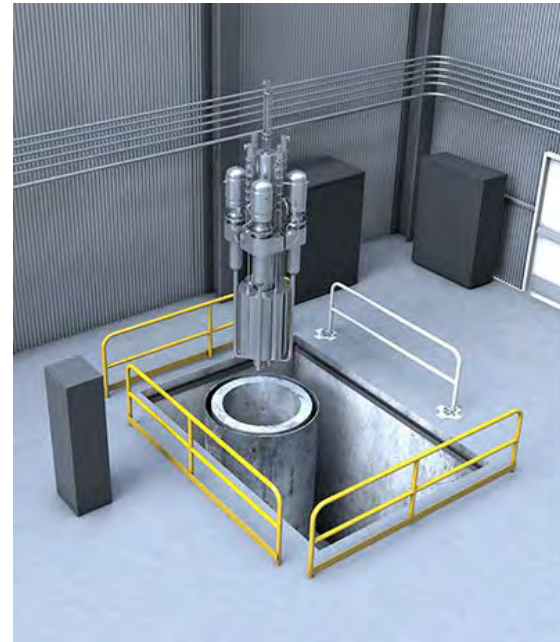
The U.S. Department of Energy's Office of Nuclear Energy established the GAIN initiative to provide the nuclear community with access to the technical, regulatory, and financial support necessary to move innovative technologies toward commercialization.

The NE Voucher Program is one way to provide industry with access to the unique research capabilities and expertise at DOE's national labs.



## ***Why a Voucher***

- Utilized to access unique capabilities
- MARVEL will be first operating microreactor
- Many potential options for use may be available
- Need to stay within voucher rules





## ***GAIN Voucher Details***

- Vouchers competitively award access to facilities and staff in the DOE national laboratory complex – NOT a financial award
- Voucher value is ~\$50K to \$500K
- Voucher recipient is responsible for 20% cost share
- One-year Period of Performance
- Standard CRADA
- Available to businesses that are majority (>51%) U.S. owned
- Limit to one application per cycle
- Four cycles per year – Next deadline is October 31<sup>st</sup>

# GAIN Vouchers – How to Apply

- Go to the GAIN Website: <https://gain.inl.gov>



HOME ABOUT **FUNDING OPPORTUNITIES** RESOURCES REGULATORY WORKSHOPS AND WEBINARS

- How to do Business Through GAIN
- NE Advance Class Patent Waiver
- Request For Information - Input to DOE-NE programmatic R&D planning (DE-SOL-0008246)
- NE Vouchers**
- Industry FOA: DE-FOA-0001817
- Advanced Reactor Demonstration FOA: DE-FOA-0002271

## Helpful Links

How to do business through GAIN

 [How to do Business through GAIN](#)

Proposal Submission System

 [Submit a Proposal](#)

Nuclear Energy Voucher Documents

 [NE Voucher Process Flowchart](#)

 [NE Voucher Request 5.1.2020](#)

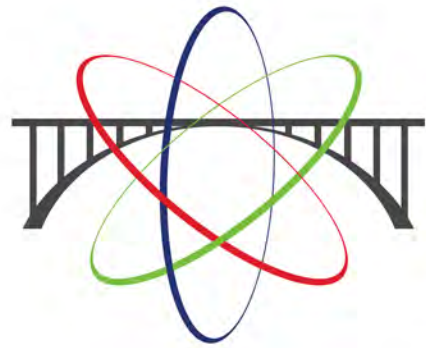
 [Voucher RFA Summary of Changes 5.01.2020](#)

 [Ten Tips for Writing a Successful NE Voucher Request](#)

 [NE Voucher FAQ's 5.1.2020](#)

 [GAIN Small Business Voucher CRADA 11.1.18](#)

 [DOE Standard CRADA 11.1.18](#)



# GAIN

Gateway for Accelerated  
Innovation in Nuclear



@GAINnuclear

gain.inl.gov



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## AVAILABLE NOW: Completed Voucher Summary

| Year ↓ | Recipient                             | Proposal  |
|--------|---------------------------------------|---|
| 2019   | Analysis & Measurement Services Corp. | Testing of I&C Sensors and Cables for Small Modular Reactors                                |
| 2018   | Exelon Corporation                    | Plasma Separation Process Feasibility Study for the Commercial Enrichment of Gadolinium-157 |
| 2018   | Vega Wave Systems                     | Radiation Testing for Nuclear Inspection Systems  |
| 2018   | Oklo Inc.                             | Accelerate Development of Industry-Relevant Features in Modern Simulation Tools             |
| 2017   | Micro Nuclear LLC                     | Development of the Microscale Nuclear Battery   |
| 2017   | Kairos Power                          | Nuclear Energy Advanced Modeling and Simulation Program Thermal-Fluids Test Stand           |

## GAIN Voucher

<https://gain.inl.gov/SitePages/Nuclear%20Energy%20Vouchers.aspx>

Kairos Power  
partnered with

Argonne National Laboratory and Idaho National Laboratory

RFA-17-14580, Nuclear Energy Advanced Modeling and Simulation Program Thermal-Fluids Test Stand

**YEAR AWARDED:** 2017

**TOTAL PROJECT VALUE:** \$500K (\$400K DOE funds awarded, \$100K awardee cost share)

**STATUS:** Completed

**PRINCIPAL LAB INVESTIGATORS:** Elia Merzari (emerzari@anl.gov); Rich Martineau (INL retired)

**DESCRIPTION:** Argonne National Laboratory (ANL), Idaho National Laboratory (INL), and Kairos Power, LLC partnered to implement a multiscale thermal-fluids hierarchy analysis methodology for Kairos' fluoride high-temperature reactor (FHR). The project demonstrated Kairos Power's design optimization process for the heat exchanger, a vital component of the reactor's design. ANL performed high-fidelity simulations of Kairos' heat exchanger design at different spatial scales. Simulations using Nek5000, an open-source computational fluid dynamic code developed under the Nuclear Energy Advanced Modeling and Simulation program analyzed the heat and fluid flow in twisted tube heat exchangers. Software design improvements were implemented in the System Analysis Module (SAM) with the ultimate goal of providing a reliable thermal-fluid system simulator for FHRs. INL implemented additional efforts to improve the software compatibility between SAM and RELAP-7 and to bring SAM in line with the Multiphysics Object-Oriented Simulation Environment (MOOSE) Software Quality Assurance Plan. A prototype-coupled simulation was performed for a simplified tank loop. Based on the MOOSE multi-app framework, this prototype-coupled code will constitute the basis of future work in this area.

**BENEFIT:** Plant-scale physics (SAM) informed by the lower-length scale (Nek5000) can significantly improve solution accuracy and reduce uncertainty when using the software in a predictive sense where little to no empirical data is available.

**IMPACT:** This collaborative process between INL, ANL, and Kairos resulted in multiscale, multiphysics advances for FHR concepts and other advanced reactor concepts. Forming a team that worked cooperatively using the same simulation tools resulted in a shared ownership of the tools.

**LESSONS LEARNED:** Improved cooperation among DOE laboratories enhanced industry partners' confidence in relying on DOE for developing advanced modeling and simulation tools.

**NEXT STEPS:** Incorporating the Griffin application environment's use into reactor physics and radiation transport should be straightforward, as both INL and ANL are developing Griffin. Including Griffin will allow the state-of-the-art calculations to be performed on most advanced reactors incorporating single-phase coolants. Finally, the BISON nuclear fuel performance code can be coupled to the system to evaluate long-term fuel phenomena, such as irradiation damage and creep.