

# Fission Battery Workshop 2021

*Wednesday, January 20, 2021*

*11:00 a.m. – 3:00 p.m. (Eastern Time)*

## **Fission Battery Initiative**

### **Technology Innovation for Fission Batteries: Autonomous Controls and Operation**

**Moderator: Youssef Ballout**

*The initiative envisions developing technologies that enable nuclear reactor systems to function as batteries and to be referred as fission batteries.*

Autonomous controls and operation are one of the required technologies to achieve the initiative vision and to ensure expanded deployment of fission batteries to meet clean energy demands across broader applications and markets.

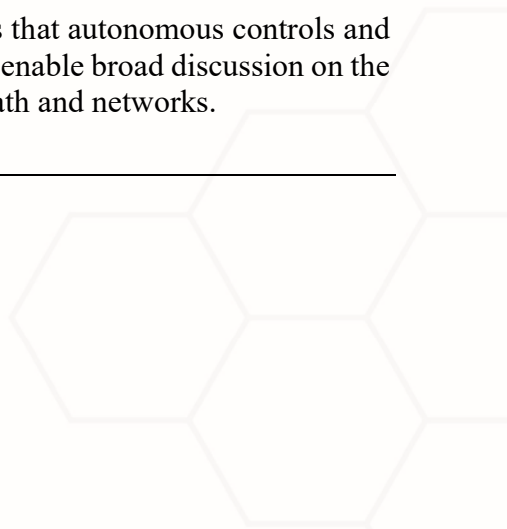
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The aim of this *Workshop* is to:

- Understand technological challenges, knowledge gaps, and limitations (development, demonstration, and deployment) associated with autonomous controls and operation of fission batteries.
- Role of Multiphysics and multi-scale modeling and simulation, reduced order methods, machine learning and artificial intelligence, and digital twins achieving autonomous controls and operation of fission batteries.

The expected outcome of this workshop is to identify technological goals that autonomous controls and operation a fission battery must achieve. Concurrently, the workshop will enable broad discussion on the potential of the new technologies and facilitate the creation of research path and networks.

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## INL & Guest Presenters

Youssef Ballout, Ph.D.  
Director of Reactor Systems Design  
and Analysis Division

Anthonie Cilliers, Ph.D.  
Senior Manager, Instrumentation, Controls, and Electrical  
Kairos Power

Professor Nam Dinh, Ph.D.  
Professor of Nuclear Engineering  
North Carolina State University

Charmaine Cecilia Sample, Ph.D.  
Senior Cybersecurity Research Officer  
Idaho National Laboratory

Yasir Arafat  
Technical Lead, Microreactor  
Idaho National Laboratory

Michael W. Sievers, Ph.D.  
Senior Systems Engineer  
JPL/NASA

Abdel-Khalik Hany, Ph.D.  
Associate Professor, School of Nuclear Engineering  
Purdue University

Linyu Lin, Ph.D.  
Post-Doctoral Research Scholar  
North Carolina State University

11:00-11:15	Fission Battery Initiative and Workshop Overview .....	Youssef Ballout Director of Reactor Systems Design and Analysis Division Idaho National Laboratory
11:15-11:40	On Challenges in Achieving Autonomy in Advanced Reactors .....	Nam Dinh/Linyu Lin Professor of Nuclear Engineering/Researcher North Carolina State University
11:40-12:05	R&D Needs to Enable Autonomous Operation for Fission Batteries .....	Yasir Arafat Technical Lead, Microreactor Idaho National Laboratory
12:05 – 12:30	Active Intelligence: Zero-Impact Interference Paradigm for Unattended Operation.....	Abdel-Khalik Hany Associate Professor of Nuclear Engineering Purdue University
12:30 – 12:45	Break.....	
12:45 – 1:10	Dispatchable, Base-Load Nuclear: The Case for a Fission Thermal Battery .....	Anthonie Cilliers Senior Manager, Instrumentation, Controls, & Electrical Kairos Power
1:10 – 1:35	AI/ML Foundations: Creating Trustworthy Solutions .....	Charmaine Cecilia Sample Cybersecurity Research Officer Idaho National Laboratory
1:35 – 2:00	Resilient Fission Battery Control: Challenges & Opportunities .....	Michael W. Sievers Senior Systems Engineer JPL/NASA
2:00 – 3:00	.....	Panel Session