



GAIN Fuel Safety Research Workshop

INL Energy Innovation Laboratory (EIL)

Idaho Falls, ID; May 1- 4, 2017



Welcome to the Idaho National Laboratory! *This is an invitation-only workshop to gather fuel safety needs from the broad range of nuclear industry. The needs will be analyzed relative to the national lab capabilities to help inform program planning and funding. It will also provide a forum to learn about transient testing from a research and regulatory perspective and to participate on a tour of ATR and MFC. We would like to thank those that agreed to present background information, overviews, perspectives, or results.*

PRESENTERS

DOE/National Labs

Kemal Pasamehmetoglu, Associate Lab Director,
Nuclear Science & Technology, INL

Rita Baranwal, GAIN Director, INL

Daniel Wachs, Scientific Lead-Transient Testing, INL

Paul Demkowicz, (rep for HTGR NTD), INL

Dave Grabaskas, (rep for FR NTD), ANL

Joel McDuffee, (rep for MSR NTD), ORNL

Jon Carmack, Advanced Fuels Campaign NTD, INL

Art Wright, TREXR, ANL

Lori Braase, GAIN Coordinator, INL

Corey McDaniel, Director of SMR Deployment, INL

Advanced Reactor Industry

Jacob DeWitte, FR TWG Chair, Oklo

Lance Kim, MSR POC, Southern Research

Farshid Shahrokhi, HTGR TWG Chair, AREVA

International Facilities

Brian Boer, Project Lead, ATTICUS Irradiation,
SCK-CEN

Takeshi MIHARA, NSRR Testing, JAEA

Mark Petit, IRSN

Margaret McGrath, HRP

Light Water Reactor Industry

Paolo Ferroni, Principal Engineer,
Westinghouse

James Malone, Chief Nuclear Fuel Development
Officer, Lightbridge Corp.

John Strumpell, AREVA

Hsiang-Ken Yueh, EPRI

Nuclear Regulatory Commission

Jeffrey Schmidt, Office of New Reactors, NRC

Steven Bajorek, Senior Technical Advisor for
Thermal-Hydraulics, NRC



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INL TOUR AGENDA

Monday May 1, 2017

INL Tour of ATR, TREAT, and MFC: Tour Guide – Ryan Weeks

7:30 Meet at the Willow Creek Building, 1955 Fremont, Idaho Falls, Idaho, for Badging

8:00 Board Bus - Depart INL - Travel to the Advanced Test Reactor (ATR)

9:00 ATR - Check In, Tour, Presenter - TTAF Staff/TBD

11:15 Board Bus - Travel to Experimental Breeder Reactor No. 1 (EBR-1)

11:45 Lunch at EBR-1: The first power plant to produce electricity using atomic energy

12:45 Board Bus - Travel to the Transient Reactor Test (TREAT)

1:15 TREAT - Check in, Tour, Presenter - Dave Broussand

2:15 Board Bus - Travel to the Materials and Fuels Complex (MFC)

2:30 Check In, Tour

Group 1

2:30 Hot Fuel Examination Facility (HFEF)

Presenter - Jason Harp

3:15 Irradiated Materials Characterization Laboratory (IMCL)

Presenter - Brandon Miller

4:00 Experimental Fuels Facility (EFF)

Presenter - Tim Hyde

Group 2

2:30 Experimental Fuels Facility (EFF)

Presenter - Tim Hyde

3:15 Hot Fuel Examination Facility (HFEF)

Presenter - Jason Harp

4:00 Irradiated Materials Characterization Laboratory (IMCL)

Presenter - Brandon Miller

4:45 Tours Conclude

5:00 Board Bus - Return to Idaho Falls

5:45 Bus Arrives at Willow Creek Building



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POSTER SESSION

Tuesday, May 2, 2017

<i>Title</i>	<i>Author(s)</i>	<i>Presenter</i>
1 INL Real Time Fuel Monitoring Capabilities	<i>Dawn M. Scates, Edward Reber</i>	Dawn Scates
2 The Fuel Accident Condition Simulator (FACS) Furnace for High Temperature Performance Testing or Irradiated Fuel	<i>Paul A. Demkowicz, Dawn M. Scates, Edward L. Reber, Les Scott, David V. Laug</i>	Paul Demkowicz
3 TREAT Transient Shaping	<i>Nicolas Woolstenhulme</i>	Nicolas Woolstenhulme
4 Static Capsules for TREAT Irradiations	<i>Nicolas Woolstenhulme</i>	Nicolas Woolstenhulme
5 ATR Transient Testing Capabilities	<i>Nicolas Woolstenhulme</i>	Nicolas Woolstenhulme
6 TREAT Real-Time Fuel Motion Monitoring System (FMMS)	<i>David Chichester, James Johnson, Scott Watson, Jay Hix, Sam Bays, Scott Thompson</i>	David Chichester
7 Ultra-High Temperature Thermocouples for In-Pile Applications	<i>Joe Palmer, Richard Skifton, Joshua Daw</i>	Joe Palmer
8 The Transient Reactor Test Loop (TRTL) Facility	<i>Daneil P. LaBrier, Wade R. Marcum</i>	Daniel LaBrier
9 Mechanical Properties on Fuel and Structural Materials	<i>J.L. Schulthess, K. Wachs, M Heighes, R Lloyd</i>	Jason Schulthess
10 Transient Testing of Advanced Fuel and Cladding Material Concepts Under Conditions Relevant to DBA and BDBA Scenarios	<i>K. Linton, M.N. Cinbiz, N. Brown, Y. Yan, K. Terrani</i>	Kory Linton
11 In-Pile Instrumentation for Fuel Safety Testing	<i>Colby Jensen</i>	Colby Jensen
12 In-Pile Instrumentation for Fuel Safety Testing	<i>Colby Jensen</i>	Colby Jensen
13 Post Irradiation Blister Testing	<i>Adam Robinson, Francine Rice, David Sell</i>	Adam Robinson



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AGENDA

Tuesday, May 2, 2017

7:30 * Registration / Coffee **EIL Conference Room**

8:00 1 Welcome, INL Overview Kemal Pasamehmetoglu

8:30 2 Safety Share, Introductions, GAIN Overview Rita Baranwal

9:00 3 Status of Transient Testing Capabilities in the US Dan Wachs

9:30 Break

LWR Fuel Safety Research Needs

10:00 4 LWR Stakeholder Survey Results and Gap Analysis Ken Yueh

11:00 Discussion

12:00 Working Lunch: Poster Session

Industry Perspectives

1:30 5 Regulatory Jeffrey Schmidt

3:00 Break

Fuel Vendor Safety Research Needs to Support Current LWR Fuel Designs

3:30 6 Westinghouse – Webcast Paolo Ferroni

4:00 7 AREVA John Strumpell

4:30 8 Lightbridge James Malone

5:00 Wrap-up Discussion Dan Wachs / Lori Braase

5:30 Adjourn

*Presentation number



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AGENDA

Wednesday, May 3, 2017

7:30 * Registration / Coffee

EIL Conference Room

Advanced Reactors Fuel Safety Research Needs

8:00 ⁹ Advanced Fuels Campaign Overview

Jon Carmack

8:45 ¹⁰ Molten Salt Reactor Survey Results and Q&A

Lance Kim

9:30 Break

10:00 ¹¹ Fast Reactor Survey Results and Q&A

Jake DeWitte

10:45 ¹² High Temperature Gas Reactor Survey Results Q&A

Farshid Shahrokhi

11:30 ¹³ Working Lunch: INL Demonstration and Deployment Capabilities

Corey McDaniel

1:00 ¹⁴ MSR/FHR Gap Analysis, Path Forward, and Q&A

Joel McDuffee

1:45 ¹⁵ FR Gap Analysis, Path Forward, and Q&A

Bob Hill

2:30 ¹⁶ HTGR Gap Analysis, Path Forward, and Q&A

Paul Demkowicz

3:15 Break

3:45 ¹⁷ Regulatory Requirements for Transient Testing

Steve Bajorek

4:15 ¹⁸ TREAT Experiment Database (TREXR)

Art Wright

4:45 Discussion: Q&A, Short-term Actions

Dan Wachs

Lori Braase

5:30 Adjourn

*Presentation number



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AGENDA

Thursday, May 4, 2017

7:30	*	Registration/Coffee	EIL Conference Room
		<i>International Fuel Safety Research and Testing Capability</i>	
8:00	¹⁹	Halden Reactor Project - Webcast	Wolfgang Wiesenack
9:00	²⁰	CABRI International Program	Mark Petit, IRSN
10:00		Break	
10:30	²¹	Nuclear Safety Research Reactor (NSRR) status, capabilities, and hot cell facilities	Takeshi Mihara, JAEA
11:30	²²	Belgium Reactor 2 (BR2)	Brian Boer, SCK-CEN
12:30		Collaboration Opportunities / Discussion	Dan Wachs / Lori Braase
1:00		Adjourn	

***Presentation number**



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ACRONYMS

ANL	Argonne National Laboratory
ART	Advanced Reactor Technologies
ATR	Advanced Test Reactor, INL
CEA	French Alternative Energies and Atomic Energy Commission
EBR-1	Experimental Breeder Reactor No. 1, INL
EFF	Experimental Fuels Facility, INL
EPRI	Electric Power Institute
FR	Fast Reactor
GAIN	Gateway for Accelerated Innovation in Nuclear
GNF	Global Nuclear Fuels
HFEF	Hot Fuel Examination Facility, INL
HRP	Halden Reactor Project
HTGR	High Temperature Gas Reactor
HTR	High Temperature Reactor
IMCL	Irradiated Materials Characterization Laboratory, INL
INL	Idaho National Laboratory
IRSN	Institute for Radiological Protection and Nuclear Safety - France
JAEA	Japan Atomic Energy Agency
LWR	Light Water Reactor
MFC	Materials and Fuels Complex, INL
MSR	Molten Salt Reactor
NNC	National Nuclear Center, Kazakhstan
NTD	National Technical Director
ORNL	Oak Ridge National Laboratory
POC	Point of Contact
SCK-CEN	Belgian Nuclear Research Center
TREXR	TREAT Experiment Relational database
TWG	Technology Working Group (Advanced Reactors)
WCB	Willow Creek Building, INL, 1955 Fremont Ave, Idaho Falls, ID