Program and Abstract Book

Nuclear & Emerging Technologies for Space (NETS-2013)

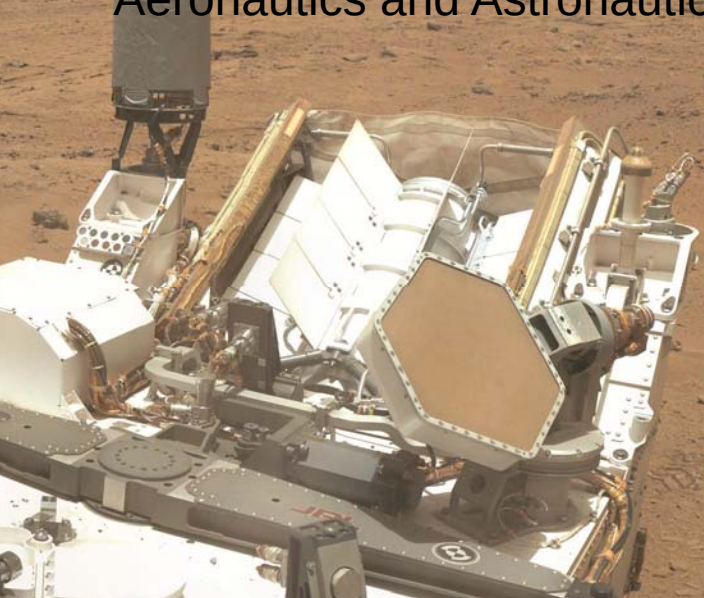
February 25-28, 2013
Albuquerque, New Mexico

Sponsored by

The American Nuclear Society
(Aerospace Nuclear Science and Technology Division and Trinity Section)

and

The American Institute for Aeronautics and Astronautics



Full Proceedings on CD
(inside back cover)

American Nuclear Society, Inc.
555 N. Kensington Avenue
La Grange Park, Illinois 60526

ISBN: 978-0-89448-098-0

ANS Order No.: 700375

About the Meeting

In February 2013 the Aerospace Nuclear Science and Technology Division (ANSTD) of the American Nuclear Society (ANS) will hold the 2013 Nuclear and Emerging Technologies for Space (NETS 2013) topical meeting in Albuquerque, NM. This conference represents the second stand-alone topical meeting in Albuquerque, NM, since the previous Space Technologies and Applications International Forum (STAIF) and follows a successful meeting in 2012, which was held in conjunction with the 43rd Lunar Planetary Science Conference.

Topic Areas

NASA is currently developing capabilities for robotic and crewed missions to the Moon, Mars, and beyond. Strategies that implement advanced power and propulsion technologies, as well as radiation protection, will be important in accomplishing these missions in the future. NETS serves as a major communications network and forum for professionals and students working in the area of space nuclear technology. Every year it facilitates the exchange of information among research and management personnel from international government, industry, academia, and the national laboratory systems. To this end, the NETS 2013 meeting will address topics ranging from overviews of current programs to methods of meeting the challenges of future space endeavors.

The 2013 conference hosts four plenary sessions and numerous technical sessions organized into five technical track areas:

Track 1: Current Space Architectures and Missions

Track 2: Present Enabling Capabilities

Track 3: Near-Term Nuclear Technologies

Track 4: Augmenting Nuclear Capabilities

Track 5: Innovative and Advanced Technologies

Plans for future NETS meetings will be electronically distributed to meeting attendees and will be posted on the ANSTD web site when they become available.

Aerospace Nuclear Science & Technology Division
http://anstd.ans.org/

Organization Sponsors

ANS Division Sponsor: Aerospace Nuclear Science & Technology Division

ANS Local Section Sponsor: ANS Trinity Section

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Meeting Sponsors

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Aerojet

Bronze Sponsor: NETS-2013 Opening Reception
National Nuclear Laboratory

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NASA-HQ

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Technical Program Committee

Technical Program Chair: John Bess, *Idaho National Laboratory*
Technical Program Co-Chair: Tom Sutliff, *NASA Glenn Research Center*

Track I: Current Space Architectures and Missions

Track Chairs
Leonard Dudzinski, *NASA-HQ*
Dr. Mike G. Houts, *NASA-MSFC*

Track II: Present Enabling Capabilities

Track Chairs
John A. Hamley, *NASA-GRC*
Alice Caponiti, *DOE-NE*

Track III: Near-Term Nuclear Technologies

Track Chairs
Andrew C. Klein, *Oregon State University*
T. Jay Harrison, *Oak Ridge National Laboratory*

Track IV: Augmenting Nuclear Capabilities

Track Chairs
Jeffrey King, *Colorado School of Mines*
Stanley K. Borowski, *NASA-GRC*

Track V: Innovative and Advanced Technologies

Track Chairs
John H. Scott, *NASA-JSC*
Steven D. Howe, *Center for Space Nuclear Research*

Technical Program Committee

Session Chairs and Reviewers

John Bess, INL
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Marty Fraeman, JHUAPL
Steven M. Geng, NASA-GRC
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Donald T. Palac, NASA-GRC
David I. Poston, LANL
A. Lou Qualls, ORNL
George Schmidt, NASA-GRC
Bruce Schnitzler, INL
Paul VanDamme, NASA-JPL
June F. Zakrajsek, NASA-GRC

Exhibitors

The Exhibit Hall will be open at the following times:

Sunday, February 24 (set-up)	1:30 pm—5:00 pm
Monday, February 25	7:00 am—5:00 pm
Tuesday, February 26	7:00 am—5:00 pm
Wednesday, February 27	7:00 am—5:00 pm
Thursday, February 28 (take-down)	7:00 am—12:00 pm

Note than all continental breakfasts and breaks will be served in the exhibit hall area.

Registration

The registration desk, located in the conference area lobby, will be open at the following times:

Sunday, February 24	3:00 pm—5:00 pm
Monday, February 25	7:00 am—5:00 pm
Tuesday, February 26	7:00 am—5:00 pm
Wednesday, February 27	7:00 am—5:00 pm

If seats are still available, attendees may purchase additional tickets for the Wednesday evening dinner at the hotel on Monday ONLY ($50 / ticket).

On-site registration and ticket purchase may be paid via cash, check paid to ANS Trinity Section, or credit card using the PayPal utility on the NETS web site (a computer with Internet connectivity will be available at the registration desk for this purpose).

Speaker Practice Room & Check-In

A computer and LCD projector will be available for speakers to make final preparations for their presentations in the **Santa Fe** room. The room will be open at the following times:

Monday, February 25	7:00 am—5:00 pm
Tuesday, February 26	7:00 am—5:00 pm
Wednesday, February 27	7:00 am—5:00 pm

Speakers should plan to attend the continental breakfast on the day of their presentation. Tables will be set up in **Salon E/F** to meet with session chairs.

Please be prepared to provide your session chair with a brief, printed biography that may be used for introduction in the session. Please also bring your presentation on a USB drive or CD for presentation from a single computer in your session.

Spouse / Guest Information

NETS would like to welcome all spouses and guests to Albuquerque! A small meeting area will be available in the **Carlsbad** room as you plan your days.

Information on area attractions including Old Town, Santa Fe, and local museums is available at the registration desk. Transportation options to these attractions will also be available.

Program Overview

Sunday, February 24

3:00-5:00	Registration
1:30-5:00	Exhibit Hall available for setup

Monday, February 25

7:00-5:00	Registration
7:00-5:00	Exhibit Hall open
7:00-8:00	Continental Breakfast (Exhibit Hall and Conference Area Lobby)
7:00-5:00	NETS Expo (Exhibit Hall: Pecos, Sandia & Acoma)
8:00-10:00	Opening Plenary (Salon E/F)
10:00-10:30	Break (Exhibit Hall)
10:30-12:30	Project Managers' Plenary (Salon E/F)
12:30-2:00	Lunch (on your own)
2:00-3:40	Technical Sessions
3:40-4:00	Break (Exhibit Hall)
4:00-5:40	Technical Sessions
6:30-10:00	Opening Tapas Reception, National Museum of Nuclear Science & History (included in registration, guests additional)

Please also see the daily "At-a-Glance" charts at the back of this abstract booklet for additional information.

Program Overview

Tuesday, February 26

7:00-5:00	Registration
7:00-5:00	Exhibit Hall open
7:00-8:00	Continental Breakfast (Exhibit Hall and Conference Area Lobby)
7:00-5:00	NETS Expo (Exhibit Hall)
8:00-10:00	Industrial Plenary (Salon E/F)
10:00-10:30	Break (Exhibit Hall)
10:30-12:00	Technical Sessions
12:00-1:30	Lunch (on your own)
1:30-3:10	Technical Sessions
3:10-3:30	Break (Exhibit Hall)
3:30-5:10	Technical Sessions
5:30-7:00	Technical Education Session
7:00	Dinner (on your own)

Wednesday, February 27

7:00-5:00	Registration
7:00-5:00	Exhibit Hall open
7:00-8:00	Continental Breakfast (Exhibit Hall and Conference Area Lobby)
7:00-5:00	NETS Expo (Exhibit Hall)
8:00-10:00	International Plenary (Salon E/F)
10:00-10:20	Break (Exhibit Hall)
10:20-12:00	Technical Sessions
12:00-1:30	Lunch (on your own)
1:30-3:10	Technical Sessions
3:10-3:30	Break (Exhibit Hall)
3:30-5:10	Technical Sessions
6:00-9:00	Banquet Dinner, Marriott Albuquerque (included in registration, guests additional)

Thursday, February 28

7:00-12:00	Exhibit Hall available for take-down

Plenary Sessions: Monday, February 25

Opening Plenary 8:00—10:00 am

Chair: Dr. Shannon Bragg-Sitton, NETS-13 General Chair, *Idaho National Laboratory*

Dr. Jim Green, NETS-2013 Honorary General Chair, *Planetary Science Division Director, NASA-HQ*

Dr. John Kelly, NETS-2013 Honorary General Chair, *Deputy Assistant Secretary for Nuclear Reactor Technologies, Office of Nuclear Energy, DOE-NE*

Dr. J. Douglas Beason, NETS-2013 Honorary General Chair, *Chief Scientist and Technology Advisor, Headquarters, Air Force Space Command*

Project Managers' Plenary 10:30 am—12:30 pm

Chair: Lee S. Mason, NETS-13 General Co-Chair, *NASA-GRC*

John A. Hamley, *Radioisotope Power Systems Program Manager, NASA-GRC*

Dirk Cairns-Gallimore, *ASRG Deputy Federal Project Director, DOE-NE*

Don Palac, *Nuclear Systems Project Manager, NASA-GRC*

Dr. Mike G. Houts, *Nuclear Cryogenic Propulsion Stage Project Manager, NASA-MSFC*

Plenary Session: Tuesday, February 26

Industry Plenary 8:00—10:00 am

Chair: Lee S. Mason, NETS-13 General Co-Chair, *NASA-GRC*

Bob LeRoy, *Director, Civil Space Systems, East Coast Operations, Lockheed Martin Space Systems Company*

Jacky Calvignac, *Chief Engineer, NGAS Propulsion Products, Northrup Grumman Corp*

Larry Trager, *Director, Advanced Power Systems, Pratt & Whitney Rocketdyne*

John Cramer, *Project Engineer, Aerojet Corporation*

Plenary Session: Wednesday, February 27

International Plenary 8:00—10:00 am

Chair: George Schmidt, *NASA-GRC*

Elisa Cliquet, *Propulsion Systems Engineer, Launcher Directorate, Centre National d'Études Spatiales (France)*

Tom Rice, *Strategic Business Development Manager, UK National Nuclear Laboratory (UK)*

Dr. Lamartine Nogueira Frutuoso Guimarães, *Institute for Advanced Studies - IEAv-BR (Brazil)*

Academician A.S. Koroteev, *General Director of SSC Keldysh Research Centre, Federal Space Agency (Russia) <invited>*

Technical Program Overview

Track 1: Current Space Architectures and Missions	
Mission Analysis and Validation Missions	Mon. pm
Spacecraft Concepts and Design	Mon. pm
Mission Environmental Considerations	Tue. am
Lunar and Planetary Concepts	Wed. pm
Track 2: Present Enabling Capabilities	
Power Conversion Systems and Components	Tue. am
Plutonium-238 Production I	Tue, pm
Plutonium-238 Production II	Tue. pm
Radioisotope Power Systems I	Wed. am
Radioisotope Power Systems II	Wed. pm
Power Electronics and Controls	Wed. pm
Track 3: Near-Term Nuclear Technologies	
The DUFF Experiment	Mon. pm
Reactor Simulation	Mon. pm
Materials and Radiation Testing	Mon. pm
Tools and Modeling	Tue. am
Fuels Development I	Tue. pm
Fuels Development II	Tue. pm
Alternative Radioisotope Systems and Applications	Tue. pm
Power Generation and Balance of Plant I	Wed. am
Power Generation and Balance of Plant II	Wed. pm
Testing and Validation	Wed. pm
Track 4: Augmenting Nuclear Capabilities	
Advanced Fuels and Materials	Tue. am
Nuclear Thermal Propulsion	Wed. pm
Track 5: Innovative and Advanced Technologies	
Advanced Concepts	Mon. pm
Fusion Systems	Tue. pm
Nuclear Electric Propulsion	Wed. am

Detailed Technical Program

Monday, February 25
2:00—3:40 pm

Track I: Current Space Architectures and Missions
Spacecraft Concepts and Design — Salon A/B

Session Chair/Co-Chair: Paul Ostdiek, *JHU-APL*; John O. Elliott, *NASA-JPL*

Accommodating an ASRG on the New Horizons Spacecraft, Douglas S. Mehoke, Edward D. Schaefer, David H. Napolillo, Elisabeth D. Abel, Martin E. Fraeman (*JHUAPL)*

Solar and Nuclear Dynamics for Medium to High-Power Space Applications, Bobby D. Middleton, William J. Martin, David E. Ames, Julius Yellowhair, Ronald J. Lipinski, Thomas Conboy, Gary E. Rochau (*SNL)*

Massively Clustered CubeSats NCPS Demo Mission, Glen A. Robertson, David Young, Tony Kim and Mike Houts (*NASA-MSFC)*

Kilowatt-class Fission Power Systems for Science and Human Precursor Missions, Lee Mason, Marc Gibson (*NASA-GRC*) and Dave Poston (*LANL*)

2:00—3:40 pm

Track III: Near-Term Nuclear Technologies
Reactor Simulation — Salon G/H

Session Chair/Co-Chair: David I. Poston, *LANL;* Andrew C. Klein, *OSU*

A Transient Simulation Test Rig for Heat Pipe Cooled Space Nuclear Reactors, Adam R. Wheeler and Andrew C. Klein *(Oregon State Univ.)*

Heat Source Controller Utilizing Reactivity Feedback Characteristics for Reactor Core Simulation, Matthew D. Carlson, David E. Ames, Thomas M. Conboy (*SNL)*

Reactor Simulator Testing, Michael P. Schoenfeld, Kenny L. Webster, J. Boise Pearson (*NASA-MSFC*)

Monday, February 25, cont'd
2:00—3:40 pm

Track V: Innovative and Advanced Technologies
Advanced Concepts — Salon I/J

Session Chair/Co-Chair: John H. Scott, *NASA-JSC*; Steven D. Howe, *CSNR*

Invitation to NIAC, Ron Turner (*ANSER*)

Use of D/H Clusters in LENR Power Sources for Space and Distributed Power, George H. Miley, Xiaoling Yang, Kyu-Jung Kim (*Univ. of Illinois, Champaign-Urbana*) and Heinrich Hora (*Univ. of New South Wales*)

Microwave Extraction of Water and Thermal-Hydraulics Analyses in a Radioactive Core of a Lunar Hopper for Steam-Propelled Flight, Rijan P. Shrestha (*Univ. of Illinois*), Nick Campbell (*Univ. of Florida*), Declan Roberts (*U. Leicester*) and Steven D. Howe (*CSNR*)

Experimental and Computational Study of HIIPER (Helicon-Injected Inertial Plasma Electrostatic Rocket), George Chen, Akshata Krishnamurthy, Paul Keutelian, Benjamin Ulmen and George H. Miley (*Univ. of Illinois*)

The Fusion - Transmutation Battery, Liviu Popa-Simil (LAVM LLC)

4:00—5:40 pm

Track I: Current Space Architectures and Missions
Mission Analysis and Validation Missions — Salon A/B

Session Chair/Co-Chair: Jacklyn R. Green, *NASA-JPL*;
Leonard Dudzinski, *NASA-HQ*

The F1 Multi-Mission Radioisotope Thermoelectric Generator (MMRTG): A Power Subsystem Enabler for the Mars Science Laboratory (MSL) Mission, Loren Jones, Victor Moreno, Robert Zimmerman (*NASA-JPL)*

Planning For Multiple NASA Missions With Use Of Enabling Radioisotope Power, S. G. Johnson J, K. L. Lively and C. C. Dwight *(INL)*

Solar System Missions with a Small Nuclear Propulsion Stage, Claude Russell Joyner II, Dr. Timothy S. Kokan and Daniel J. H. Levack (*Pratt & Whitney Rocketdyne*)

Monday, February 25, cont'd
4:00—5:40 pm

Track III: Near-Term Nuclear Technologies
The DUFF Experiment — Salon G/H

Session Chair/Co-Chair: David I. Poston, *LANL;* Marc A. Gibson, *NASA-GRC*

The DUFF Experiment – Why and How, David D. Dixon, Patrick R. McClure, Timothy E. Beller, David I. Poston (*LANL*), Marc A. Gibson (*NASA-GRC*), and Stacey D. Bagg (*NASA-MSFC*)

Heat Pipe Powered Stirling Conversion for the Demonstration Using Flattop Fission (DUFF) Test, Marc A. Gibson, Max Briggs (*NASA-GRC*), Jim Sanzi (*Vantage Partners, LLC*), Mike Brace (*NASA-GRC*), Dave I. Poston and David D. Dixon (*LANL*)

A Simple, Low-Power Fission Reactor for Space Exploration Power Systems, David I. Poston, David D. Dixon, Patrick R. McClure (*LANL*) and Marc A. Gibson (*NASA-GRC*)

The DUFF Experiment – What Was Learned? David I. Poston, Patrick R. McClure, David D. Dixon *(LANL)*, and Marc A. Gibson (*NASA-GRC*)

4:00—5:40 pm

Track III: Near-Term Nuclear Technologies
Materials and Radiation Testing — Salon I/J

Session Chair/Co-Chair: Cheryl L. Bowman, *NASA-GRC;* A. Lou Qualls, *ORNL*

A Nanocomposite Material for Space Exploration, Leri Rukhadze, Elguja R. Kutelia, Nodar Maisuradze, B. Eristavi (*Georgian Technical Univ.*) and Sayavur I. Bakhtiyarov (*US Air Force Safety Center*)

Design Issues for Using Magnetic Materials in Radiation Environments at Elevated Temperature, Cheryl L. Bowman (*NASA-GRC)*

High Compliance Thermal Interface Material for Space Applications, Christopher M. Dyson and John Thayer (*Thermacore, Inc.)*

Tuesday, February 26
10:20 am—12:00 pm

Track I: Current Space Architectures and Missions
Mission Environmental Considerations — Salon A/B

Session Chair/Co-Chair: Ronald J. Lipinski, *SNL*; Ryan Bechtel, *DOE-NE*

Consequence Analysis for Mars Science Laboratory Launch Safety Study, Nathan E. Bixler, Chris J. Clutz (*SNL*), Nelson A. Deane, Darryl G. Hoover (*Lockheed Martin Corporation*), and Ronald J. Lipinski (*SNL*)

Dose Calculations for Nuclear Thermal Rocket Exhaust, Greg Lucas, Nathan E. Bixler and Ronald J. Lipinski (*SNL*)

Technological Advances in Radiological Contingency Planning for the 2011 Mars Science Laboratory Mission, Randall E. Scott (*NASA-KSC*), John M. Phillips (*NASA-JPL*), Steven G. Homann, Ronald L. Baskett (*LLNL*), and Dirk A. Cairns-Gallimore (*DOE-NE*)

Planetary Protection Concerns During Pre-Launch Radioisotope Power System Final Integration Activities, Fei Chen (*CIT*), Terri Mckay *(NASA-GRC)*, James Andy Spry *(NASA-JPL)*, Anthony Colozza (NASA-*GRC*), Salvador Distefano (*CIT*) and Robert Cataldo (NASA-*GRC*)

10:20 am—12:00 pm

Track II: Present Enabling Capabilities
Power Conversion Systems and Components — Salon C/D

Session Chair/Co-Chair: Salvatore M. Oriti, *NASA-GRC*;
Jean-Paul Fleurial, *NASA-JPL*

Structural Dynamics Testing of Advanced Stirling Convertor Components, Sal Oriti and Zach Williams (*NASA-GRC)*

External Magnetic Field Reduction Techniques for the Advanced Stirling Radioisotope Generator, Janis M. Niedra *(Vantage Partners LLC)* and Steven M. Geng *(NASA-GRC)*

An Approach to Turbomachinery for Supercritical Brayton Space Power Cycles, T. Conboy (*SNL)*

Lap Shear Testing Of Candidate Radiator Panel Adhesives, David Ellis, Maxwell Briggs (*NASA-GRC*) and Ryan McGowan (*Univ. of Notre Dame*)

Tuesday, February 26, cont'd
10:20 am—12:00 pm

Track III: Near-Term Nuclear Technologies
Tools and Modeling — Salon G/H

Session Chair/Co-Chair: Robert C. O'Brien, *INL;* Andrew C. Klein, *OSU*

DRAGON5: Designing Computational Schemes Dedicated to Fission Nuclear Reactors for Space, Alain Hébert *(École Polytechnique de Montréal, Institut de Génie Nucléaire)*

Deleterious Thermal Effects Due To Randomized Flow Paths in Pebble Bed, and Particle Bed Style Reactors, Robert. P. Moran *(NASA-MSFC)*

Benchmark Evaluation of the Medium-Power Reactor Experiment Program Critical Configurations, Margaret A. Marshall (*CSNR*) and John D. Bess (*INL*)

Validation of FSP Reactor Design with Sensitivity Studies of Beryllium-Reflected Critical Assemblies, John D. Bess (*INL*) and Margaret A. Marshall (*CSNR*)

10:20 am—12:00 pm

Track IV: Augmenting Nuclear Capabilities
Advanced Fuels and Materials — Salon I/J

Session Chair/Co-Chair: Jeffrey C. King, *CSM*; Bruce G. Schnitzler, *INL*

Advanced Space-based Nuclear Energy Platforms: the Pebble Bed Modular Reactor, Silicon Carbide and Molten-Salt Compatibility, Stephen A. Boyd (*Aufbau Laboratories, LLC*), Kim L. Johnson (*Cheminnovár*), Cavan Stone *(Shirley, MA),* John. L. Palumbo (*Aufbau Laboratories, LLC*)

Fabrication of Cerium Oxide and Uranium Oxide Microspheres for Space Nuclear Power Applications, Jeffrey A. Katalenich, Michael R. Hartman (*Univ. Michigan*), Robert C. O'Brien and Steven D. Howe (*CSNR*)

Hot Hydrogen Testing of CERMET and Graphite Based Fuel Elements for a Nuclear Cryogenic Propulsion Stage, R. R. Hickman, J. W. Broadway, O. R. Mireles (*NASA-MSFC*) and D. E. Bradley (*Yetispace Huntsville*)

Multiphysics Modeling of a Single Channel in a Nuclear Thermal Propulsion Grooved Ring Fuel Element, Laura A. Barkett (*Ducommun Miltec; Univ. Alabama*), William J. Emrich Jr. (*NASA-MSFC*), Adam D. Mathias (*Ducommun Miltec; Univ. Alabama*), Jason T. Cassibry (*Univ. Alabama*) and Tony Kim (*NASA-MSFC*)

Tuesday, February 26, cont'd
1:30—3:10 pm

Track II: Present Enabling Capabilities
Plutonium-238 Production - I — Salon C/D

Session Chair/Co-Chair: Becky Onuschak, *DOE-NE;*
John A. Hamley, *NASA-GRC*

Plutonium-238 Supply Project: A One Year Summary, Robert M. Wham (*ORNL)*

Mechanism For Oxygen-18 Gas Exchange With Cerium (IV) Oxide – A Plutonium Dioxide Surrogate, Christofer E. Whiting, Bethany M. Cremeans, Chadwick D. Barklay, and Daniel P. Kramer (*Univ. Dayton Research Institute)*

Ex-Core Production of Plutonium 238 in Commercial Power Reactors, Gary S. Carter (*AREVA)*

1:30—3:10 pm

Track III: Near-Term Nuclear Technologies
Fuels Development - I — Salon G/H

Session Chair/Co-Chair: Omar R. Mireles, *NASA-MSFC*; A. Lou Qualls, *ORNL*

Advances in the Development of a WCl_6 CVD System for Coating UO_2 Powders with Tungsten, Omar R. Mireles (*NASA-MSFC*), Alyssa Tieman (*Univ. Alabama*), Jeramie Broadway, and Robert Hickman (*NASA-MSFC*)

Design of a Uranium Dioxide Spheroidization System, Daniel P. Cavender, Omar R. Mireles (*NASA-MSFC*) and Abdelkader Frendi (*Univ. Alabama-Huntsville*)

Characterization of Advanced Fuels for Nuclear Thermal Propulsion,
Shannon Bragg-Sitton, Jason Harp, Jonathan Webb and Melissa Teague (INL)

Radioisotope Thermophotovoltaic Batteries for Universal Low Power Systems
C. Gwyn Rosaire (*Texas A&M Univ.*), Matthew J Heinemann (*Iowa State Univ.*), Caleb S. MacLachlan (*US Air Force Academy*) and Stephen D Howe (*CSNR*)

Tuesday, February 26, cont'd
1:30—3:10 pm

Track V: Innovative and Advanced Technologies
Fusion Systems — Salon I/J

Session Chair/Co-Chair: Steven D. Howe, *CSNR*; John H. Scott, *NASA-JSC*

Progress In The Development Of The Charger-1 Pulse Power Facility For Fusion Propulsion Research, Ross J. Cortez, Jason T. Cassibry (*Univ. Alabama*) and William A. Seidler (*Boeing, Inc.*)

Progress in Development of ^{6}LiD Wires for the Charger-1 Pulse Power Facility for Fusion Propulsion Research, William T. Rogerson, Jr. and Sam W. Brown (*Y-12 National Security Complex*)

Initial Design Process For A Pulsed Thermonuclear Fusion Reaction Engine, Ross J. Cortez, Jason T. Cassibry (*Univ. Alabama*) and William A. Seidler (*Boeing, Inc.*)

Direct Energy Conversion for Low Specific Mass In-Space Power and Propulsion, John H. Scott, Jeffrey A. George (*NASA-JSC*) and Alfonso Tarditi (*EPRI*)

3:30—5:10 pm

Track II: Present Enabling Capabilities
Plutonium-238 Production - II — Salon C/D

Session Chair/Co-Chair: Steven D. Howe, *CSNR*; Becky Onuschak, *DOE-NE*

Preconceptual Feasibility Study to Evaluate Alternative Means to Produce Plutonium-238, John D. Bess (*INL*), Matthew S. Everson (*INL; MIT*)

Economical Production of Pu-238, Steven D. Howe *(CSNR)*, Terry Ring *(Univ. Utah)*, Douglas Crawford and Jorge Navarro *(CSNR)*

Static Image Analysis in $^{238}PuO_2$ Particle Size Distribution Measurement, Brian Berger (*Univ. Dayton*), Roberta Mulford and Rene Chavarria (*LANL)*

Tuesday, February 26, cont'd
3:30—5:10 pm

Track III: Near-Term Nuclear Technologies
Fuels Development - II — Salon G/H

Session Chair/Co-Chair: Robert Hickman, *NASA-MSFC;* A. Lou Qualls, *ORNL*

Development of a Radiological Spark Plasma Sintering Facility, R.C. O'Brien (*CSNR*), J. Tolman, J. Templeton, J. Moore (*Thermal Technology*), D. Houlton, T. Michael, R. Bentley (*Innovative Technology)*

The Fabrication of CERMET Fuels for Nuclear Thermal Propulsion, Jeramie Broadway, Robert Hickman (*NASA-MSFC)*

Affordable Production of Cermet Fuels for NTP Applications, R.C. O'Brien, S. Cook, N. Jerred, S.D. Howe (*CSNR*), R. Samborsky, D. Brasuell (*Aerojet Corporation*)

3:30—5:10 pm

Track III: Near-Term Nuclear Technologies
Alternative Radioisotope Systems and Applications — Salon I/J

Session Chair/Co-Chair: Richard Ambrosi, *U. Leicester;* Andrew C. Klein, *OSU*

Progress on ^{241}Am production for use in Radioisotope Power Systems, M.J. Sarsfield, K. Bell, C.J. Maher, M.J. Carrott, C. Gregson, J. Brown, D.A., Woodhead, S.R. Baker, L. Cordingley, R.J. Taylor, T.P. Tinsley, T.G. Rice and C.J. Rhodes, M. Clough (*UK NNL*)

Integrated Planetary Exploration Using Bimodal Radioisotope Power and Propulsion, C. Gwyn Rosaire (*Texas A&M Univ.*), Matthew J Heinemann (*Iowa State Univ.*), Dhaval Mysore Krishna (*Univ. Kansas*), Srikrishna S. Chittur (*San Jose State Univ.*), Caleb S MacLachlan (*US Air Force Academy*) and Stephen D Howe (*CSNR*)

Development And Testing Of An Americium-241 Radioisotope Thermoelectric Generator, R.M. Ambrosi, H.R. Williams, P. Samara-Ratna (*U. Leicester*), A. Jorden, R. Slade (*Astrium Ltd.*), N.P. Bannister, J. Sykes (*U. Leicester*), T. Deacon (*Astrium Ltd.*), K. Stephenson (*ESA*), K. Simpson (*European Thermodynamics Ltd*), M. Reece, H. Ning (*Queen Mary Univ. London*), M. Stuttard (*Astrium Ltd.*), T. Rice, T. Tinsley, M. Sarsfield (*UK NNL*), M. Jaegle, J. Koenig (*Fraunhofer IPM*), A. Edgington and H. Lerman (*U. Leicester*)

ESPA-Class 200 We RTG Experiment, William W. Saylor (*Monument Satellite Systems, Inc*), Caleb S. MacLachlan (*US Air Force Academy*)

Tuesday, February 26, cont'd
5:30—7:00 pm

Technical Educational Session
Communicating about Space Nuclear with the Public Salon E/F

Moderators: Thomas J. Sutliff, *NASA-GRC*; Alice Caponiti, *DOE-NE*

Presenters: Ryan Bechtel, US DOE Power Systems Safety Manager
Doug Isbell, NASA Risk Communication Coordinator
Preston Dyches, NASA RPS Program Education & Public Outreach Lead

Communications staff from NASA and DOE will share useful language, resources and lessons learned from recent missions and activities. Topics covered will include:

- Primer on communications related to space radioisotope power
- Outreach activities and lessons learned from the launch of the Mars rover Curiosity
- Resources for Engagement: NASA & DOE materials and resources for EPO

Please come join the group for this informal, informative workshop!

Wednesday, February 27
10:20 am—12:00 pm

Track II: Present Enabling Capabilities
Radioisotope Power Systems - I Salon C/D

Session Chair/Co-Chair: Dirk Cairns-Gallimore, *DOE-NE*;
Ed Lewandowski, *NASA-GRC*

The Mars Science Laboratory (MSL) MMRTG In-Flight: A Power Update, David Woerner, Victor Moreno, Loren Jones, Robert Zimmerman and Eric Wood *(NASA-JPL)*

Advanced Stirling Radioisotope Generator Life Certification Plan, Jeffrey J. Rusick and Edward J. Zampino (*NASA-GRC)*

Development of a Phasor Diagram Creator to Visualize the Piston and Displacer Forces in an Advanced Stirling Convertor, Dipanjan Saha and Edward J. Lewandowski (*NASA-GRC)*

Wednesday, February 27, cont'd
10:20 am—12:00 pm

Track III: Near-Term Nuclear Technologies
Power Generation and Balance of Plant - I — Salon G/H

Session Chair/Co-Chair: Steven M. Geng, *NASA-GRC*; A. Lou Qualls, *ORNL*

A Nuclear Cryogenic Propulsion Stage for Near-Term Space Missions, Michael G. Houts, Tony Kim, William J. Emrich, Robert R. Hickman, Jeramie W. Broadway, Harold P. Gerrish, Robert B. Adams *(NASA-MSFC)*, Ryan D. Bechtel *(US DOE),* Stanley K. Borowski *(NASA-GRC),* Jeffrey A. George *(NASA-JSC)*

Alkali Metal Heat Pipes for Space Fission Power, Kara L. Walker, Calin Tarau, and William G. Anderson (*Advanced Cooling Technologies, Inc.)*

Assessment of a 10kWe small reactor system, Elisa Cliquet-Moreno, Jean-Marc Ruault (*CNES*), Jean-Pierre Roux, Brice Cazale and Laurent Manifacier (*AREVA TA*)

Space Molten Salt Reactor for Colonization-Level Surface Power, Ethan Chaleff, Michael Eades, Justin Flanders, Xiaodong Sun, Thomas Blue (*The Ohio State Univ.)*

10:20 am—12:00 pm

Track V: Innovative and Advanced Technologies
Nuclear Electric Propulsion — Salon I/J

Session Chair/Co-Chair: Steven D. Howe, *CSNR;* John H. Scott, *NASA-JSC*

Minimizing System Mass for a Closed Brayton System as a Function of Reactor Specific Mass for Nuclear Electric Propulsion Missions, Michael Eades, Ethan Chaleff, Xiaodong Sun (*The Ohio State Univ.*), Albert Juhasz (*NASA-GRC*), Thomas Blue (*The Ohio State Univ.*)

Fast and Robust Human Missions to Mars with Advanced Nuclear Electric Power and VASIMR® Propulsion, Franklin R. Chang Díaz, Mark D. Carter, Timothy W. Glover, Andrew V. Ilin, Christopher S. Olsen, Jared P. Squire (*Ad Astra Rocket Company*), Ron J. Litchford (*NASA-MSFC*), Nobuhiro Harada (*Nagaoka Univ. of Technology*) and Steven L. Koontz (*NASA-JSC*)

Dusty Plasma Based Fission Fragment Nuclear Rocket, Rodney L. Clark, Robert B. Sheldon, and Robert O. Werka *(Grassmere Dynamics LLC)*

Feasibility of Traveling Wave Direct Energy Conversion of Fission Reaction Fragments, A. G. Tarditi (*EPRI*), J. A. George (*NASA-JSC*), G. H. Miley (*Univ. Illinois-Urbana-Champaign*) and J. H. Scott (*NASA-JSC*)

Wednesday, February 27, cont'd
1:30—3:10 pm

Track II: Present Enabling Capabilities
Radioisotope Power Systems - II — Salon C/D

Session Chair/Co-Chair: June F. Zakrajsek, *NASA-GRC;* Dirk Cairns-Gallimore, *DOE-NE*

Multi-Mission Radioisotope Thermoelectric Generator (MMRTG): Building On Success, Thomas E. Hammel, Russell Bennett, Steve Keyser and Robert Sievers (*Teledyne Energy Systems, Inc.)*

Summary of Stirling Convertor Testing at NASA Glenn Research Center in Support of Stirling Radioisotope Power System Development, Nicholas A. Schifer and Salvatore Oriti (*NASA-GRC*)

Capsule Compatibility Studies On MAR-M-247®, Daniel P. Kramer, Steve M. Goodrich, Thomas N. Wittberg, Christofer E. Whiting, Chadwick D. Barklay, and Bethany M. Cremeans *(Univ. Dayton)*

1:30—3:10 pm

Track III: Near-Term Nuclear Technologies
Power Generation and Balance of Plant - II — Salon G/H

Session Chair/Co-Chair: Steven M. Geng, *NASA-GRC;* A. Lou Qualls, *ORNL*

An Analytical Evaluation of the Advanced Stirling Radioisotope Generator (ASRG) Dynamic Characteristics and Its Influence on a Spacecraft's Operational Performance, Edward D. Schaefer (*JHUAPL*) and Steven D. Thelander (*Federal-Mogul Corp.*)

Advances in Power Conversion on the Brayton Cycle Loop of the TERRA project Lamartine N. F. Guimaraes, Guilherme M. Placco, Natalia B. Marcelino (*Institute for Advanced Studies*), Ary Garcia Barrios Jr., Eduardo M. Borges (*FATESF*) and Jamil A. Nascimento (*Institute for Advanced Studies*)

Lightweight Carbon Fiber Radiator for High-Temperature Nuclear Electric Powered Spacecraft, Briana N. Tomboulian *(Univ. Massachusetts)*, Lee S. Mason *(NASA-GRC)* and Robert W. Hyers *(Univ. Massachusetts)*

Progress in the Development of a 12 kW_e Stirling Power Conversion Unit for Fission Power Systems, John Stanley, J. Gary Wood, Ezekiel Holliday (*Sunpower, Inc*), and Steven M. Geng (*NASA-GRC*)

Wednesday, February 27, cont'd
1:30—3:10 pm

Track IV: Augmenting Nuclear Capabilities
Nuclear Thermal Propulsion — Salon I/J

Session Chair/Co-Chair: Bruce G. Schnitzler, *INL*; Jeffrey C. King, *CSM*

Design and Analysis of a Single Stage to Orbit Nuclear Thermal Rocket Engine, Satira I. Labib (*CSM*), Peter J. A. Husemeyer (*Univ. Cambridge*), Oreste Giusti, Justin D. Rothenberg (*San Jose State Univ.*), Jeffrey King (*CSM*) and Steven Howe (*CSNR*)

Nuclear Thermal Rocket Engine Integration into a Single-Stage to Orbit Launch Platform, Oreste Giusti, Justin Rothenberg (*San Jose State Univ.*), Peter Husemeyer (*Univ. Cambridge*), Satira Labib (*CSM*), Steven Howe (*CSNR*), and Jeffrey King (*CSM*)

Augmented Nuclear Thermal Rocket for Human Mars Missions, Melvin Bulman and Victor Collazo-Perez *(Aerojet)*

Nuclear Thermal Rocket Element Environmental Simulator (NTREES) Phase II Upgrade Activities, William J Emrich, Jr , Robert P. Moran, and J. Boise Pearson (*NASA-MSFC*)

3:30—5:10 pm

Track I: Current Space Architectures and Missions
Lunar and Planetary Concepts — Salon A/B

Session Chair/Co-Chair: Donald T. Palac, *NASA-GRC*;
Mike G. Houts, *NASA-MSFC*

Potential Applications for Radioisotope Power Systems in Support of Human Exploration Missions, Robert L. Cataldo (*NASA-GRC*), Anthony J. Colozza (*Vantage Partners, LLC*), Paul C. Schmitz (*Alphaport*)

Variable Conductance Heat Pipe Radiator Trade Study for Lunar Fission Power Systems, William G. Anderson, Bryan J. Muzyka, and John R. Hartenstine (*Advanced Cooling Technologies, Inc.)*

Wednesday, February 27, cont'd
3:30—5:10 pm

Track II: Present Enabling Capabilities
Power Electronics and Controls — Salon C/D

Session Chair/Co-Chair: Matthew Dolloff, *NASA-GRC*;
Marty Fraeman, *JHU-APL*

Alkali Metal Backup Cooling for Stirling Systems – Experimental Results, Carl Schwendeman, Calin Tarau, William G. Anderson (*Advanced Cooling Technologies, Inc.*) and Peggy A. Cornell (*NASA-GRC*)

Thermal Management Using a Hypervapotron; Part I: Some Controlling Parameters, Ronald D. Boyd (*Prairie View A&M Univ.)*

Thermal Control of Operationally Responsive Space (ORS) Satellites, Sidrit Kosta and John G. Thayer (*Thermacore, Inc*.)

3:30—5:10 pm

Track III: Near-Term Nuclear Technologies
Testing and Validation — Salon G/H

Session Chair/Co-Chair: Maxwell H. Briggs, *NASA-GRC*;
Robert C. O'Brien, *INL*

Development of the Variable Atmosphere Testing Facility for Blow-Down Analysis of the Mars Hopper Prototype, Nathan D. Jerred, Robert C. O'Brien, Steven D. Howe and James E. O'Brien (*CSNR*)

Cold-end Subsystem Testing for the Fission Power System Technology Demonstration Unit, Maxwell Briggs, Marc Gibson, David Ellis (*NASA-GRC*) and James Sanzi (*Vantage Corp.*)

Autonomous I&C Health Monitoring and Diagnostics for Fission Power Systems, B.D. Shumaker, J.R. McCulley, H.M. Hashemian (*Analysis and Measurement Services Corp.)*

A Compact NaK Coolant Test Loop in an Argon Atmosphere, D. J. Rowekamp, A. V. Giminaro, and M. L. Grossbeck *(Univ. Tennessee)*

Key Speaker Biographies

Dr. Jim Green

NETS-2013 Honorary General Chair
Planetary Science Division Director, NASA-HQ

Dr. Green received his Ph.D. in Space Physics from the University of Iowa in 1979 and began working in the Magnetospheric Physics Branch at NASA's Marshall Space Flight Center (MSFC) in 1980. At Marshall, Dr. Green developed and managed the Space Physics Analysis Network that provided scientists all over the world with rapid access to data, to other scientists, and to specific NASA computer and information resources. In addition, Dr. Green was a Safety Diver in the Neutral Buoyancy tank, making over 150 dives until leaving MSFC in 1985.

From 1985 to 1992 he was the head of the National Space Science Data Center (NSSDC) at Goddard Space Flight Center (GSFC). The NSSDC is NASA's largest space science data archive. In 1992, he became the Chief of the Space Science Data Operations Office until 2005, when he became the Chief of the Science Proposal Support Office. While at GSFC, Dr. Green was a co-investigator and the Deputy Project Scientist on the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) mission. He has written over 100 scientific articles in refereed journals involving various aspects of the Earth's and Jupiter's magnetospheres and over 50 technical articles on various aspects of data systems and networks.

In August 2006, Dr. Green became the Director of the Planetary Science Division at NASA Headquarters. Over his career, Dr. Green has received numerous awards. In 1988, he received the Arthur S. Flemming award given for outstanding individual performance in the federal government and was awarded Japan's Kotani Prize in 1996 in recognition of his international science data management activities.

Dr. John E. Kelly

NETS-2013 Honorary General Chair
Deputy Assistant Secretary for Nuclear Reactor Technologies
Office of Nuclear Energy, DOE-NE

Dr. John E. Kelly was appointed Deputy Assistant Secretary for Nuclear Reactor Technologies in the Office of Nuclear Energy in October 2010. He is responsible for the Department of Energy's nuclear reactor research and development programs for Light Water Reactors, Gas Cooled Reactors, Small Modular Reactors, and advanced reactor concepts. His office is also responsible for the space and defense power systems program within DOE-NE.

Prior to joining the Department of Energy, Dr. Kelly spent 30 years at Sandia National Laboratories where he was engaged in a broad spectrum of research programs in nuclear reactor safety, advanced nuclear energy technology, and national security. In the reactor safety field, he led efforts to establish the scientific basis for assessing the risks of nuclear power plant operation and specifically those risks associated with potential accident scenarios. His research focused on core melt progression phenomena and led to an improved understanding of the Three Mile Island accident. In the advanced nuclear energy technology field, he led Sandia's efforts to develop advanced concepts for space nuclear power, Generation IV reactors, and proliferation-resistant and safe fuel cycles. These research activities explored new technologies aimed at improving the safety and affordability of nuclear power. In the national security field, he led national efforts to evaluate the safety and technical viability of tritium production technologies.

Dr. Kelly is an active member of the American Nuclear Society and has served on the Nuclear Installations Safety Division for the last two decades in a number of leadership positions. His committee work has focused on increasing the publication of scientific work in the nuclear safety field and in developing national positions on the safety of nuclear power.

Born in Detroit, Michigan, Dr. Kelly received his B.S. in nuclear engineering from the University of Michigan in 1976 and his Ph.D. in nuclear engineering from the Massachusetts Institute of Technology in 1980. Dr. Kelly is married and has three children.

Dr. J. Douglas Beason

NETS-2013 Honorary General Chair
Chief Scientist and Technology Advisor
Headquarters, Air Force Space Command

Dr. J. Douglas Beason, a Senior Level executive, is Chief Scientist and Technology Adviser, Headquarters Air Force Space Command, Peterson Air Force Base, Colo. He serves as the primary adviser to the commander on all scientific and technical (S&T) matters concerning space and cyberspace, and is delegated the authority to guide the substantive S&T program activities within the command. Dr. Beason represents AFSPC S&T on decisions, high-level planning, and policy throughout the U.S. government, industry, academia, the international community, and other scientific and technology organizations at venues that affect the command.

Dr. Beason has more than 30 years of research and development experience that spans conducting basic research to directing cross-disciplinary, applied-science national security programs. He has served on the White House staff working for the President's science adviser under both the Bush and Clinton administrations where he was the key White House staffer for space. He worked on a Vice Presidential Commission to give the nation options to return to the Moon and go to Mars, and has been a member of numerous review boards, including the Air Force Science Advisory Board and the United Kingdom's Atomic Weapons Establishment Threat Reduction Review Board.

Dr. Beason was previously the Associate Laboratory Director (Threat Reduction) and Field Intelligence Director at Los Alamos National Laboratory, N.M, where he was responsible for all programs and people that reduced the global threat of weapons of mass destruction. A graduate of the USAF Academy, he is a Fellow of the American Physical Society and is the author of more than 100 publications and 14 books.

John A. Hamley

Radioisotope Power Systems Program Manager, NASA-GRC

John Hamley is the Manager of the Radioisotope Power Systems Program. The RPS Program Office is a level II program office at the Glenn Research Center which manages the agency-level program. The program resides in the Planetary Sciences Division of the Science Mission Directorate at NASA HQ.

Hamley joined NASA in 1985 developing digital data acquisition and control systems for space flight experiments. He has held positions of increasing responsibility including leading development of flight power and control avionics for electric propulsion and space plasma devices. He has held Branch Chief positions in space test engineering and flight projects offices and was Chief of the Science Division. He was also Chief of the GRC Constellation Office and Center point of contact for the Constellation Program.

Most recently he was the Acting Deputy Director of the Space Flight Systems Directorate. In this position, he supported the Space Flight Systems Directorate Office in center-level planning, organizing, and directing of activities required to develop flight and ground systems in support of NASA's exploration and science objectives.

Hamley received his bachelor's degree in electrical engineering from the Youngstown State University in 1985. He also received master's degrees in electrical engineering and business administration from Cleveland State University in 1990 and 2003.

Dirk Cairns-Gallimore

ASRG Deputy Federal Project Director, DOE-NE

Mr. Cairns-Gallimore has a BS in Nuclear Engineering from Oregon State University.

He has been employed by the Department of Energy for 11 years, where he served in various positions including: team member for the Space reactor program for the Department of Energy's Nuclear Energy's Office of Space and Defense Power Systems, headquarters manager of the Office of Space and Defense Power Systems operations at INL during the RTG fueling for Pluto New Horizons, Deputy and Project Manager for the Mutli-Mission Radioisotope Generator, and is currently the DOE Deputy Project Director for the Advanced Stirling Radioisotope Power System.

Recent Awards:
2012 Secretary of Energy Achievement Award for the Mars Science Laboratory Multi-Mission Radioisotope Generator.

Donald T. Palac

Nuclear Systems Project Manager, NASA-GRC

Donald T. Palac is an engineering project manager for the NASA John H. Glenn Research Center's research into nuclear surface power for the U.S. Space Exploration Policy. He joined the NASA staff in 1987.

His project management experience includes space transportation systems development, spacecraft and upper stage development, hypersonic access to space research, and electric propulsion and power research and development. He led development of the Discovery mission proposal that eventually became the Dawn spacecraft, and oversaw the development of Mars Pathfinder flight experiments from NASA Glenn. Prior to joining NASA, he served as an officer in the U.S. Air Force, managing DoD spacecraft/launch vehicle integration, and was a Test Director for Defense Support Program early warning spacecraft initial on-orbit testing.

Don has a Bachelor of Science degree in Aeronautical and Astronautical Engineering from Purdue University, a Master of Astronautics degree from the Air Force Institute of Technology, and a Master of Business Administration degree from California State University at Dominguez Hills.

Dr. Mike G. Houts

Nuclear Cryogenic Propulsion Stage Project Manager, NASA-MSFC

Dr. Houts has a Ph.D. in Nuclear Engineering from the Massachusetts Institute of Technology.

He was employed at Los Alamos National Laboratory for 11 years, where he served in various positions including Team Leader for Criticality, Reactor, and Radiation Physics and Deputy Group Leader of the 70-person Nuclear Design and Risk Analysis group.

Dr. Houts currently serves as Nuclear Research Manager for NASA's Marshall Space Flight Center, where he has been employed for 11 years.

He is also the manager of NASA's Nuclear Cryogenic Propulsion Stage (NCPS) project.

Recent Awards:
NASA Exceptional Engineering Achievement Medal (2012)
NASA Space Flight Awareness Honoree (2012)
NASA Certificate of Appreciation (2011)
NASA MSFC Director's Commendation Honor Award (2010)

Robert J. LeRoy

Director, Civil Space Systems, East Coast Operations
Lockheed Martin Space Systems Company

As Director, Civil Space Systems, Mr. LeRoy is responsible for developing and executing space and earth science missions for both NASA and NOAA and advanced space power programs for DOE plus related IRAD. Current and recent programs reporting to Mr. LeRoy in these areas include the Hubble programs with NASA GSFC including operation and servicing of the Hubble Space Telescope and the Hubble Robotic Vehicle Deorbit Module, the GOES-R architecture study and capture of the GOES-R Preliminary Design and Risk Reduction Phase, and development of the next generation radioisotope power supply under the Advanced Stirling Radioisotope Generator program.

Previously, as Director, Architecture Development, Mr. LeRoy was responsible for supporting the architecture formulation of national programs that involved multiple companies within Lockheed Martin. Mr. LeRoy also served as LM's Program Director for NASA's Next Generation Space Telescope Phase 1 Study from July 1999 to September 2002.

Prior to NGST, Mr. LeRoy worked in Lockheed Martin's Valley Forge facility as Chief Engineer and then Program Manager of Landsat 7 (October 1992 to June 1999). Landsat 7 was launched in April 1999 under budget and on time. The satellite is still surpassing mission requirements far beyond its five-year mission. The Landsat 7 team has been recognized with several awards including Aviation Week and Space Technology Aerospace Laurel Honors, the AIAA Space Systems Award, and both NASA HQ and GSFC Group Achievement Awards.

Mr. LeRoy's earlier assignments have included work in both manufacturing and engineering on the Upper Atmosphere Research Satellite for GSFC, the Advanced Communication Technology Satellite for the Glenn Research Center and management of numerous IRAD projects in the area of satellite design. Mr. LeRoy's work has been recognized within Lockheed Martin with a General Manager's Award, a Technical Excellence Award and a Team Excellence Award.

Mr. LeRoy holds both Bachelor of Engineering and M.S. degrees in Mechanical Engineering from State University of New York at Stony Brook. As an undergraduate, he was two-time All-American in football. Mr. LeRoy served as a member of the Dean's Advisory Board at the University of Maryland Baltimore County.

Jacky Calvignac

Chief Engineer, NGAS Propulsion Products
Northrup Grumman Corporation

- Chief Engineer for NGAS Propulsion Products.
- Principal Investigator for Advanced Propulsion R&D projects.
- Mr. Jacky Calvignac has 25 years of experience in advanced rocket propulsion technology. He has led designs for reaction control thrusters for Reusable Launch Vehicles, and is involved in spacecraft, missile and space transportation advanced propulsion developments.
- Published papers on design and testing of non-toxic engines.
- Engineering Degree of École Nationale de l'Aéronautique et de l'Espace, Toulouse, France.

Larry Trager

Director, Advanced Power Systems
Pratt & Whitney Rocketdyne

Currently, Larry Trager is Director of the Advanced Power Systems business for Pratt & Whitney Rocketdyne (PWR). Previously he was General Manager of Hamilton Sundstrand Rocketdyne (HSR), a division of Hamilton Sundstrand, United Technologies Corporation. Larry is responsible for the overall leadership of the Advanced Power Systems business at Rocketdyne. Current key programs include Power Systems & Technology for the International Space Station, Multi-Mission Radioisotope Thermal Electric Generator (MMRTG), Orion/MPCEV Power, Thermal and Software. MMRTG is the power source for the Mars Science Lab mission which has been operating on the surface of Mars since August, 2012. Rocketdyne has a rich heritage in the development of space nuclear fission power and propulsion technologies through its involvement in most of the past U.S. space nuclear power reactor development programs. This experience spans more than 50 years in the design, system engineering, integration and testing of the space nuclear electrical power and nuclear propulsion systems.

Prior to his current assignment, he was the Controller for the HSR business and previously served as Manager of Financial Planning and Overhead Cost for Pratt & Whitney Rocketdyne.

Larry Trager holds a BS degree in Business Administration from Ohio State University, an MBA from Xavier University, and completed a Masters in Quality Management from the National Graduate School. Following his undergraduate education, he served as an officer in the U.S. Army and was awarded the Army commendation medal for superior service.

Larry's hobbies include marathon running and long distance cycling, golf, scuba diving, skiing, and most outdoor activities and spends as much time as possible with his wife and five year old boxer.

Dr. John M. Cramer

Project Engineer
Aerojet Corporation

Dr. Cramer has been working in the rocket propulsion field for the past 28 years. For the past 3 years, he has been a Project Engineer at Aerojet. Prior to joining Aerojet, John gained a broad range of propulsion experience in the government (16 years at NASA- Marshall Space Flight Center), academia, and small business. He has worked on the design, development and testing of a broad range of propulsion systems including: upper stage engines, rocket based combined cycle engines, nuclear thermal propulsion systems, cryogenic propellant management systems, and numerous combustion devices.

He has mechanical engineering degrees from Purdue University, the University of Wisconsin-Madison, and Penn State University.

Elisa Cliquet

Propulsion Systems Engineer, Launcher Directorate
Centre National d'Études Spatiales (CNES)

- **Propulsion Systems engineer at the Launcher Directorate (DLA) of the French space agency CNES, in charge of technical support for:**
  - ◊ Future projects of liquid rocket engines (national and European programs)
  - ◊ Advanced propulsion : particularly nuclear propulsion and detonation
  - ◊ Transient analysis software CARINS (CNES in-house code)
  - ◊ Qualification authority technical support on Ariane 5 ECA HM7B LOx-LH2 upper stage engine
- **At CNES since May 2005**
- **Graduated from "École Centrale" engineering school**
- **Awarded 2010 Youth prize by AAAF (Association Aéronautique et Astronautique de France, French equivalent of AIAA)**
- **Member of the French Mars Society (Association Planète Mars)**

Tom Rice

Strategic Business Development Manager
UK National Nuclear Laboratory

Tom Rice is Strategic Business Development manager at the UK's National Nuclear Laboratory (NNL). He is responsible for developing business opportunities in the medium and longer term for the NNL. Involvement in the European Space Agency (ESA) radioisotope development programme flowed from NNL's desire to utilise its facilities, skills and expertise in nuclear technology into new areas of work for the laboratory.

Tom has been with NNL and its predecessor organisations for over 34 years. He was originally employed as a research physicist and has managed programmes across the nuclear fuel cycle from oxide fuel development through spent fuel reprocessing. In his business development role, he has commercial responsibility for many of NNL's international programmes and has spent several years of his career working overseas in Japan.

Dr. Lamartine Nogueira Frutuoso Guimarães

Head, Nuclear Energy Division (ENU)
Institute for Advanced Studies - IEAv-BR

- Dr. Lamartine Guimarães has a Bachelor in Physics and a Master in Nuclear Engineering from Brazilian education institutions, respectively in 1981 and 1984.

- He obtained his Ph.D. in Nuclear Engineering from The University of Tennessee, Knoxville, TN, in 1992.

- He has worked since 1984 at the Nuclear Energy Division (ENU), of the Institute for Advanced Studies (IEAv) located in São José dos Campos, São Paulo State, Brazil.

- In 1997, he assumed the vice-head of the ENU, and in 2005 he became the Head of the Nuclear Energy Division.

Since 2000 he has been interested in applying nuclear technology for electricity and propulsion generation in space. In 2008 he conceived and proposed the TERRA project, which is related with nuclear technology for space application. Since then he has been its principal conductor.

Academician A.S. Koroteev

General Director of SSC Keldysh Research Centre
Federal Space Agency (Russia)

(Invited)

NETS-2013 At-a-Glance

Time	Monday, February 25, 2013						
	Registration	Exhibit Hall	Carlsbad	Salon E/F			
0700-0800	Registration & Help Desk Open 0700-1700	Continental Breakfast					
0800-1000		Exhibit Hall Open 0700-1700	Spouse/ Guest Hospitality Room Open 0700-1700	Opening Plenary: Welcome & Keynote Speakers			
1000-1030				Break			
1030-1230				Project Managers' Plenary			
1230-1400				Lunch (on your own)			
				Salon A/B	Salon C/D	Salon G/H	Salon I/J
1400-1540				Track I: Spacecraft Concepts and Design	No Session	Track III: Reactor Simulation	Track V: Advanced Concepts
1540-1600				Break			
1600-1740				Track I: Mission Analysis and Validation Missions	No Session	Track III: The DUFF Experiment	Track III: Materials and Radiation Testing
1830-2200	Opening Tapas Reception, National Museum of Nuclear Science & History						

NETS-2013 At-a-Glance

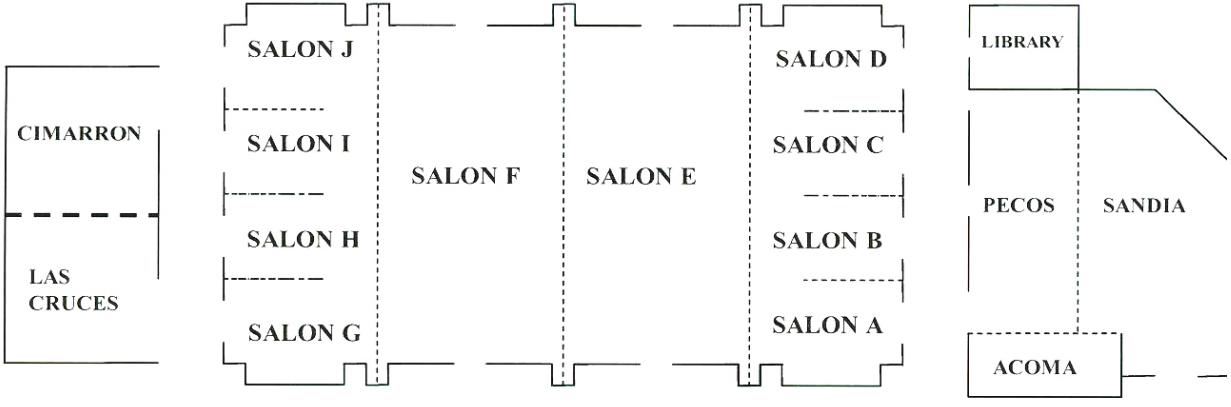
Time	Tuesday, February 26, 2013						
	Registration	Exhibit Hall	Carlsbad	Salon E/F			
0700-0800	Registration & Help Desk Open 0700-1700	Continental Breakfast					
0800-1000		Exhibit Hall Open 0700-1700	Spouse/ Guest Hospitality Room Open 0700-1700	Industry Plenary			
1000-1020				Break			
				Salon A/B	Salon C/D	Salon G/H	Salon I/J
1020-1200				Track I: Mission Environmental Considerations	Track II: Power Conversion Systems and Components	Track III: Tools and Modeling	Track IV: Advanced Fuels and Materials
1200-1330				Lunch (on your own)			
1330-1510				No Session	Track II: Plutonium-238 Production - I	Track III: Fuels Development	Track V: Fusion Systems
1510-1530				Break			
1530-1710				No Session	Track II: Plutonium-238 Production - II	Track III: Fuels Development	Track III: Alternative Radioisotope Systems and Applications
1730-1900				Technical Education Session - Salon E/F			
1900-	Dinner (on your own)						

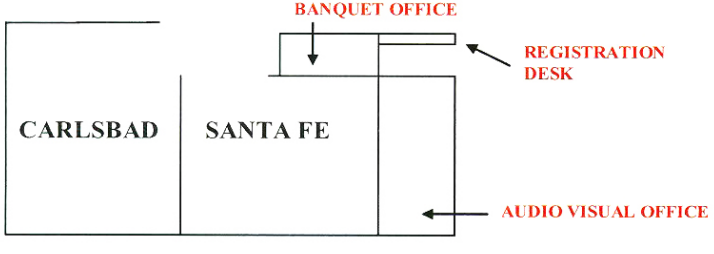
NETS-2013 At-a-Glance

Time	Wednesday February 27, 2013						
	Registration	Exhibit Hall	Carlsbad	Salon E/F			
0700-0800	Registration & Help Desk Open 0700-1700	Continental Breakfast					
0800-1000		Exhibit Hall Open 0700-1700	Spouse/ Guest Hospitality Room Open 0700-1700	International Plenary			
1000-1020				Break			
				Salon A/B	Salon C/D	Salon G/H	Salon I/J
1020-1200				No Session	Track II: Radioisotope Power Systems - I	Track III: Power Generation and Balance of Plant - I	Track V: Nuclear Electric Propulsion
1200-1330				Lunch (on your own)			
1330-1510				No Session	Track II: Radioisotope Power Systems - II	Track III: Power Generation and Balance of Plant - II	Track IV: Nuclear Thermal Propulsion
1510-1530				Break			
1530-1710				Track I - Lunar and Planetary Concepts	Track II: Power Electronics and Controls	Track III: Testing and Validation	No Session
1800-2100	Banquet Dinner, Marriott Albuquerque						

Marriott
ALBUQUERQUE

Meeting Space Diagram:





Lower Level

Taos Conference Room

Second Level

Taos Boardroom