### MONDAY, AUGUST 20

#### CRESTONE A

**RESILIENCE ENGINEERING ASSOCIATION**  
Chair: Beth Lay

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>1:30-5:00</td>
<td>The NASA Space Station role play simulation illustrates issues studied by a branch of resilience that developed around 2000 about safety in complex human-technological systems. The case and follow up panel discussions highlight the new synthesis that lies at the intersection of cognitive, social, computational, and engineered systems. The role play is led by Beth Lay, Principle, Applied Resilience, LLC and Resilience Engineering Association. E. Asher Balkin, Cognitive Systems Engineering Laboratory, Ohio State University David D. Woods, Past-President, Resilience Engineering Association.</td>
</tr>
</tbody>
</table>

**Panel Discussion 1:**  
*Does the Oroville Dam Spillway event reveal the same patterns about resilience and safety as the NASA Space Station event?*  
*Panelists: Tom Seager, Arizona State University; Daniel Eisenberg, Naval Post-Graduate School; E. Asher Balkin, Ohio State University*

**Panel Discussion 2:**  
*Provocation: Engineering can build more robust systems; only people can provide the capability for resilient performance.*  
*Panelists: David Alderson, Naval Post-Graduate School; Tom Seager, Arizona State University; Beth Lay and David D. Woods, Resilience Engineering Association*

**Panel Discussion 3:**  
*The missing infrastructure: digital services.*  
*Panelists: David D. Woods, SNAFU Catchers, the Ohio State University; Asher Balkin, SNAFU Catchers, the Ohio State University Respondents and discussion: Daniel Eisenberg, Naval Post-Graduate School David Alderson, Naval Post-Graduate School*

#### CRESTONE FOYER

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>5:00-7:00</td>
<td>Registration and Sponsored Reception</td>
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</table>

### TUESDAY, AUGUST 21

#### CRYSTAL B/C

**Sponsor Welcome and Governor Introduction:**  
Zach Tudor, Associate Laboratory Director, Idaho National Laboratory

**Resilience Week Welcome:**  
Donna Lynne, Colorado Lt Governor

**Plenary Panelists Introduction:**  
Mark Rice, Senior Power System Research Engineer, PNNL-Facilitator

**Plenary Panel:**  
*Cooperative Research*  
*Panelists: Adrian Chavez, Dynamic Defense & Network Randomization, Sandia National Laboratories; Manimaran Govindarasu, Professor, Iowa State University; Dan Massey, Professor, University of Colorado-Boulder; Kevin Reifsteck, Director for Critical Infrastructure Cybersecurity, National Security Council; Doug Maughan, Director, Department of Homeland Security*

#### CRYSTAL B/C

**Cyber Needs and Current Technologies**  
*Chairs: Nadia Carlsen, DHS S&T; Craig Rieger, INL*

<table>
<thead>
<tr>
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</table>
| 9:30-10:30 | **Keynote Introduction:** Nadia Carlsen, DHS S&T  
**Keynote:** Doug Maughan, Director, DHS S&T, Re-inventing Cybersecurity R&D: How DHS is Innovating to Deliver More Secure Systems |

#### CRESTONE B

**Infrastructure**  
*Chairs: David Alderson, NPS; Cherrie Black, INL*

<table>
<thead>
<tr>
<th>Time</th>
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</table>
| 9:30-10:30 | **Panel:** The Roles of Planners, Engineers, and Economists in Urban Resilience Planning  
**Moderator:** Vanessa Vargas, SNL  
**Panelists:** Nancy Sutley, L.A. Department of Water and Power; Katrina Kelly-Pitou, University of Pittsburgh; David Kang, University of Colorado Boulder; Ian Lange, Colorado School of Mines; Morgan Bazilian, Colorado School of Mines |
## Resilience Week 2018

### Morning Break

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<th>Time</th>
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<tbody>
<tr>
<td>10:30</td>
<td>Morning Break</td>
<td>Lightning Talks: How to Think About Resilience</td>
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</tbody>
</table>

### Invited Presenters
- Paul Ferrillo, Greenberg Traurig, Cybersecurity 2020: Solving Today’s problems for a safer and more secure tomorrow
- Marty Edwards, Automation Federation, Think like a hacker, but act like an engineer

### Lightning Talks: Invited Presenters
- Eliza Hotchkiss, NREL, An Approach to Resilience: Lessons Learned and Best Practices
- Janusz Zalewski, FL Gulf Coast Univ., Would you help me understand what resilience is? Some fundamental concepts in protecting critical systems
- Daniel Eisenberg, NPS, Everything that’s wrong with the critical functionality curve for resilience
- David Alderson, NPS, The Nature of Surprise
- Thomas Seager, ASU, Robustness and Extensibility in Surprise Management

### No-host Lunch

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<th>CRESTONE B</th>
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<tbody>
<tr>
<td>12:00</td>
<td>No-host Lunch</td>
<td>Lightning Talks: Student Competition</td>
<td></td>
</tr>
<tr>
<td>1:30</td>
<td>AVOIDING SKYNET</td>
<td>NEW CYBER TECHNOLOGIES</td>
<td>INFRASTRUCTURE</td>
</tr>
<tr>
<td></td>
<td>Chair: Julie Marble, JHUAPL</td>
<td>Chairs: Nadia Carlsten, DHS S&amp;T; Craig Rieger, INL</td>
<td>Chairs: David Alderson, NPS; Cherrie Black, INL</td>
</tr>
</tbody>
</table>

### 1:30-3:30

- Anthony Crawford, INL, Integrating Physiological Hand Resilience into Human Machine Interfaces
- Bill Lawless, The fundamental social measurement problem: Perturbations, resilience, Skynet’s slaved things, intelligent things, information loss and virtual mass
- Julie Marble, JHUAPL, Platform Assessing Risk and Trust in Non-Economic Relationships
- Mollie McGuire, NPS, Integrity Based Trust in Autonomy
- Joel Doehle, PNNL, SilentAlarm
- Richard Skowrya, MITLL, Dynamic Flow Isolation
- Jason Laska, ORNL, Real-Time Cyber Physical Attack Detection
- Adrian Chavez, SNL, Dynamic Defense & Network Randomization
- Richard Skowrya MITLL, Quantitative Attack Space Analysis and Reasoning
- Richard Robinson, Cynash, Protecting Critical Systems with Nature-inspired Cybersecurity Solutions

### Lightning Talks: Lightning Talks
- Cynthia Lee, GT, Updating and Evaluating System Model Parameters for Enhanced Situational Awareness and Resilience of Interdependent Critical Infrastructures
- Karl Thompson, UI at Urbana-Champaign, Modeling Multi-modal Transportation for Improved Resilience of the US Air Transportation Network
- Maria Robson, Northeastern Univ. Critical Infrastructure Interdependencies: Exploring Transportation and Energy Cyber Vulnerabilities Using Boston as a Case Study
- Vivek Kumar Singh, ISU, Anomaly Detection for Wide-Area Protection and its Evaluation using Testbed Federation
- Venkatakiran Marri, GWU, Monitoring and Mitigating Resilience Degradation in Engineered Systems

### CRESTONE FOYER

#### RECEPTION WITH MULTIPLE PARALLEL ACTIVITIES

<table>
<thead>
<tr>
<th>Time</th>
<th>POSTER PRESENTATION</th>
<th>TRANSITION TO PRACTICE DEMONSTRATION</th>
<th>GAMING COMPETITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>3:30</td>
<td>Papers accepted for poster only Infrastructure Abstracts</td>
<td>Multiple technologies presented in previous sessions</td>
<td>Capture the Flag Maze Game Grid Game</td>
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</tbody>
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#### Chairs:
- Amanda Joyce, ANL; Tim McJunkin, INL
- Amanda Joyce, ANL; Tim McJunkin, INL
### Wednesday, August 22

**CRYSTAL B/C**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:30</td>
<td>Registration and Breakfast</td>
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<tr>
<td>8:15</td>
<td>Student Competition Winners</td>
</tr>
<tr>
<td>8:20</td>
<td><strong>Plenary Panelists Introduction:</strong> Andy Bochman, Chief Grid Strategist, Idaho National Laboratory</td>
</tr>
</tbody>
</table>
| 8:30-9:30 | **Plenary Panel:** Industry Leader Perspectives on Lifeline Sector Interdependencies and Threats  
Panelists: Kent Kildow, Director of Business Continuity and Emergency Management, Verizon  
Ryan Frillman, Chief Information Security Officer, Spire Energy; Reid Fudge, CISO, Tri-State Generation and Transmission Association |
| 9:30-10:30 | **Lightning Talks:** Applications of Resilience  
- Christopher Dixon, INL, Dynamics of Multilayer Complex Infrastructure Networks  
- Samuel Markolf, ASU, Vulnerabilities and Resilience within Interconnected Transportation, Energy, Water, and ICT Infrastructure Systems: An Assessment of Direct and Indirect Pathways of Disruption Posed by Climate Change and Extreme Events  
- Beth Lay, Applied Resilience, Could this Happen Again? Resilience Engineer view of Astronaut near drowning  
- C.J. Unis, SNL, Financing Resiliency, from Smart Urban Design to Reconstruction |
| 10:30  | Morning Break                               |
| 11:00-12:00 | **Keynote Introduction:** Cherrie Black, INL  
**Keynote:** David Alderson, NPS, Attacker-Defender Models for Assessing and Improving Infrastructure Resilience |
| 12:00  | Hosted Lunch                               |
| 12:25  | **Plenary Introduction:** Andy Bochman, Idaho National Laboratory |

**CRYSTAL A**

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| 9:30-10:30 | C. Birk Jones, SNL, Intrusion Detection & Response using an Unsupervised Artificial Neural Network on a Single Board Computer for Building Control Resilience  
Nicholas Jacobs, SNL, Measurement and Analysis of Cyber Resilience for Control Systems: An Illustrative Example |

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| 9:30-10:30 | Joseph L. Loof, UND, Unsupervised Classification of Frequency Hopped Signals in Frequency-Selective Channels  
Md Sharif Ullah, ODU, Towards Modeling Attacker’s Opportunity for Improving Cyber Resilience in Energy Delivery Systems  
Leonardo De La Rosa, UDel, Efficient Characterization and Classification of Malware Using Deep Learning |

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| 9:30-10:30 | Lightning Talks: Applications of Resilience  
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- Samuel Markolf, ASU, Vulnerabilities and Resilience within Interconnected Transportation, Energy, Water, and ICT Infrastructure Systems: An Assessment of Direct and Indirect Pathways of Disruption Posed by Climate Change and Extreme Events  
- Beth Lay, Applied Resilience, Could this Happen Again? Resilience Engineer view of Astronaut near drowning  
- C.J. Unis, SNL, Financing Resiliency, from Smart Urban Design to Reconstruction |

**INFRASTRUCTURE R&D**

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<tr>
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| 11:00-12:00 | *Bjorn Vaagensmith, INL, An Integrated Approach to Improving Power Grid Reliability: Merging of Probabilistic Risk Assessment with Resilience Metrics  
Katrina Kelly-Pitou UPitt, Locating Microgrids to Improve Smart City Resilience  
Vivek Kumar Singh, ISU, A Hierarchical Multi-Agent Based Anomaly Detection for Wide-Area Protection in Smart Grid  
Sri Nikhil Gupta Gourisetti, PNNL, A Cyber Secure Communication Architecture for Multi-Site Hardware-in-the-Loop Co-Simulation of DER Control |

**C. Birk Jones, SNL, Intrusion Detection & Response using an Unsupervised Artificial Neural Network on a Single Board Computer for Building Control Resilience**

**Nicholas Jacobs, SNL, Measurement and Analysis of Cyber Resilience for Control Systems: An Illustrative Example**
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<th>Crystal B</th>
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</thead>
</table>
| 1:30-2:30 | Keynote Introduction: Craig Rieger, INL  
**Keynote:** Jeff Taft, Grid Modernization Chief Architect, PNNL, **Grid Resilience From the Perspective of Grid Architecture**  
Panel: Risk Communication for Mitigation and Resilience Implementation Efforts  
**Moderator:** Ellie Graeden, Talus Analytics  
**Panelists:** Shayle Nelson, Larimer County Office of Emergency Management; Stephen Cauffman, NIST; Hussam Mahmoud, CSU; Molly O’Donnell, Disaster Recovery Project Longmont, Colorado | **CRONOS B** | **CRESTONE A** | **CRESTONE B** |
| | | | COGNITIVE R&D  
Chairs: Roger Lew, UI; Tom Ulrich, INL | CYBER R&D  
Chairs: David Manz, PNNL; Amanda Joyce, ANL | INFRASTRUCTURE  
Chairs: David Alderson, NPS; Cherrie Black, INL |
| 2:30-3:30 | ● Thomas Ulrich, INL, Trouble in Paradise: Mutual Awareness, Teamwork, and Hawaii False Ballistic Missile Alert  
● Aditya Sundararajan, FIU, A Tri-Modular Framework to Minimize Smart Grid Cyber-Attack Cognitive Gap in Utility Control Centers  
● David A. Grimm, GTech, Systems Level Evaluation of Resilience in Human-Autonomy Teaming under Degraded Conditions | ● Peter Hawrylak, UTul, Methodology to Estimate Attack Graph System State from a Simulation of a Nuclear Research Reactor  
● Srikhil Gupta Gourisetty, PNNL, Blockchain: Next Generation Supply Chain Security for Energy Infrastructure and NERC Critical Infrastructure Protection Compliance | Lightning Talks:  
● Jennifer Jiménez-González, Univ. of Puerto Rico, Compound Index: Reliability, Resilience, and Social Forces for the Sustainability of Isolated Community Microgrids After Catastrophic Weather Events  
● Sean DeRosa, SNL, Puerto Rico Microgrid Siting for Resilience  
● Paul Roege, Creative Erg, Digital Power for Resilience  
● Frederic Petit, ANL, A Decision Analytic Approach to Electric Infrastructure Resilience  
● John Thomas, ASU, How governance and decentralized applications can impact the resilience and sustainability of electric power systems with embedded blockchain technologies | |
| 3:30 | Afternoon Break | | | |
| 4:00-5:30 | ● Joe Loof, UND, Preamble-Free Binary Polarization Shift Keying in Frequency Selective Channels  
● Daniel Sullivan, ARL, Mission Resilience For Future Army Tactical Network  
Chair: Krishna Kant, Temple  
Panel: Owners and Operators Addressing Infrastructure Risk and Resilience (Lifeline Sectors)  
**Moderator:** Eliza Hotchkiss, NREL  
**Panelists:** Matt Ziska, Xcel Energy; Steve Kuhr, Colorado Springs Utilities; Becky Franco, Denver Water; Kelly Morrison, AT&T Disaster Recovery | INFRASTRUCTURE  
Chairs: David Alderson, NPS; Cherrie Black, INL |
| 5:30 | Adjourn Meetings | | | |
| 6:30-8:30 | | | | Sponsored Reception Highlighting Best Papers |

*Best Paper in Topical Area (3)*
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<td><strong>Plenary Introduction:</strong> Dan Elmore, Critical Infrastructure Protection Director, Idaho National Laboratory</td>
</tr>
<tr>
<td>8:30–9:30</td>
<td><strong>Plenary:</strong> John Garstka, Deputy Director, Cyber, Office of the Under Secretary of Defense, Perspectives on Operating in a Cyber Contested Environment</td>
</tr>
</tbody>
</table>
| 9:30–10:30 | **Keynote Introduction:** Craig Rieger, Idaho National Laboratory  
**Keynote:** Kathleen Tierney, Research Professor, UC-Boulder, Social and Community Resilience |
| 10:30  | Morning Break                                                                      |
| 11:00–12:30 | **Panel:** Perspectives on Community Resilience  
**Moderator:** Kathleen Tierney, UC-Boulder  
**Panelists:** Karen MacClune, Institute for Social and Environmental Transition (I-S-E-T); Andrew Rumbach, UC-Denver; Gregory Guibert, Gothic Mountain Ventures |
| 12:30–1:30 | No-host Lunch                                                                     |
| 1:30–2:30 | **Keynote Introduction:** Tim McJunkin, Idaho National Laboratory  
**Keynote:** Ariel Greenberg, Sr. Research Scientist, JHU/APL, Moral-Scene Assessment for Intelligent Systems |
| 2:30–4:00 | **Panel:** Case Studies on the Application of Cognitive and Social Sciences to the Cyber-Physical World  
**Moderator:** Tim McJunkin, INL  
**Panelists:** Katya LeBlanc, INL; Phil Bennett, SNL; Tom Ulrich, INL; Aunshul Rege, Temple; David Manz, PNNL |
<p>| 4:00   | Adjourn Symposium                                                                  |
| 4:30   | No-host Social                                                                    |</p>
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<tr>
<td>9:00-12:00</td>
<td><strong>Tours at NREL:</strong> The Energy Systems Integration Facility (ESIF) provides a unique contained and controlled platform on which our partners can identify and resolve the technical, operational, and financial risks of integrating emerging energy technologies into today’s environment.</td>
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</table>