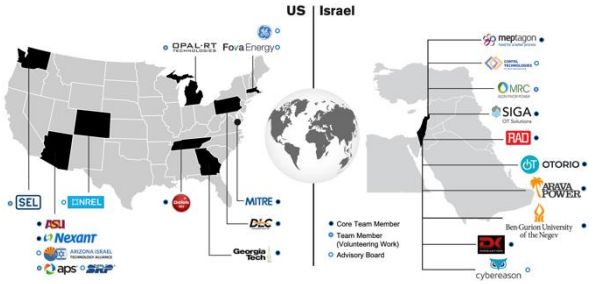
BIRD
Israel-U.S.
Binational Industrial Research
and Development Foundation



U.S.-Israel Energy Center

Cybersecurity Technology for Critical Power Infrastructure AI-Based Centralized Defense and Edge Resilience

US-Israel Energy Center ICRDE Workshop V

October 9-11, 2023

Arizona State University & Ben-Gurion University of the Negev

Arizona / Phoenix Time: 8:30am ~ 5:00pm

Workshop Venue: Hyatt Place Tempe / Phoenix Hotel

601 E. 6th Street, Tempe, AZ 85281

Introduction of US-Israel Energy Center ICRDE Workshop V

Welcome to the US-Israel Cybersecurity R&D for Energy (ICRDE) Workshop V. We are delighted to have this opportunity to meet in-person at Arizona State University and share some of the progress updates and outcomes of this Israel-US binational joint project with the consortium members and cybersecurity experts from the industry, academia, national laboratories, and government agencies. The workshop will be held at the Hyatt Place Tempe Hotel near the ASU campus on October 9-11. There will be invited presentations that focus on *tool development*, *integration*, demonstration of the *practical values and potential impact* of the research outcomes that include cyberattack monitoring and mitigation, and *commercialization* in collaboration with industry partners. The workshop will be streamed via zoom video conferencing and recorded for future reference. The video link is: https://asu.zoom.us/j/8963769165

Highlights of Workshop Events

- Keynote speeches, project update presentations by Principal Investigators, presentations of new research ideas, networking opportunities
- Panel discussions focusing on the emerging technologies and urgent R&D needs in cybersecurity for energy systems, meetings with cybersecurity experts to discuss collaboration, business opportunities and commercialization, demonstrations of company products and solutions
- Tour of nearby attractions and the Grand Canyon

Workshop Agenda

Moderators: Prof. Yang Weng and Prof. Rami Puzis (all times shown are in AZ time)

Day 1, October 9, Monday, 08:30-17:00

08:30 - 09:00 **Continental breakfast at Hyatt Place**

09:00 - 09:10 Workshop Opening and Welcome
Dr. Kyle Squires, Dean, Ira A. Fulton Schools of Engineering, ASU
Tal Fischelovitch, Director of Partnerships, US-Israel Energy Center

09:10 - 09:40 Keynote speech: Challenges in Energy Transformation with an Eye to Cybersecurity
Dr. Gideon Friedmann, Chief Scientist, Israel Ministry of Energy

Session 1: Modelling and Monitoring of Energy Systems (19:40 - 20:50 Israeli time)

09:40 - 10:00 Identifying common operational patterns (COPEs) in ICS using temporal pattern mining approach
Asaf Shabtai (BGU)

10:00 - 10:20 Breaking OT test bed
Harry Thomas, Matan Dobrushin (OTORIO)

10:20 - 10:50 Assured machine learning and cyber deployment
Yang Weng (ASU), John Dirkman (Resource Innovations/Nexant)

10:50 - 11:00 **Coffee & Tea Break**

Session 2: Tools for Learning & Detection of Cyberattacks of IT/OT Architecture (1/2) (21:00 - 22:30 Israeli time)

11:00 - 11:30 Towards safety-critical commercial-grade Artificial Intelligence to enhance grid reliability and cybersecurity
Lalitha Sankar, Joel Mathias (ASU)

11:30 - 11:50 Sequential patterns-based anomaly detection
Robert Moskovitch (BGU)

11:50 - 12:10 Deepfake Voice Call Detection: Mitigating Next-Gen Social Engineering
Guy Frankovits, Yisroel Mirsky (BGU)

12:10 - 12:30 Improving anomalies detection using XAI
Liat Antwarg, Bracha Shapira (BGU)

12:30 - 13:30	**Lunch at Hyatt Place**
13:10 - 13:30	ASU Global Overview Julia Rosen, Vice President of Global Academic Initiatives, ASU

Session 3: Tools for Learning & Detection of Cyberattacks of IT/OT Architecture (2/2) (23:30 - +1 01:00 +1 Israeli time)

13:30 - 14:00	Threat intelligence and threat hunting plugins for RAM^2 Nir Daniel, Rami Puzis (BGU)
14:00 – 14:30	Practical Deployment Architecture for Alerting Malware Activities in ICS/SCADA Networks Bo Feng, Moses Ike, Wenke Lee (GIT)
14:30 - 15:00	False data injection Yang Weng, Napoleon Enriquez (ASU), Michael Hylton, Ilan Gendelman, Hagai Galili (SIGA OT)
15:00 - 15:10	**Coffee & Tea Break**

Discussion of ICRDE Project Extension, 15:10-17:00 (+1 01:10 - 03:00 Israeli time)

Presentation of new research ideas (each presentation ~5 minutes, 15:10-16:10):

- Dov Shirtz, Ben-Gurion University, Israel
  Closing the gaps between IT and OT
- Robert Moskovitch, Ben-Gurion University, Israel
  Improving situational awareness using the development of similarity function with interval patterns
- Wenke Lee, Georgia Institute of Technology, USA
  Achieving security and reliability of industrial control systems using data-driven models informed by physical domain knowledge
- Ying-Cheng Lai, Arizona State University, USA
  Advanced machine-learning based attack detection and cyber-defense of power grids
- Sukarno Mertoguno, Georgia Institute of Technology, USA
  RISC-V Program Execution Monitoring & Control (PEMon)
- Sukarno Mertoguno, Georgia Institute of Technology, USA
  RumRaisin on Chip (RRoC)
- Ron Insler, RAD, Israel
  AI for NG traffic engineering and services

- Larisa Tsirinsky, Embedded Solutions, Israel
  1D convolutional neural networks for bit net sentry
- Ilan Gendelman, SIGA OT, Israel
  Simulated attack generation and optimization of SIGA's detection based on inter-level monitoring
- Open discussion, 16:10-17:00 (may need to clear the room by 16:45)

17:30 - 18:30 **Poster Session**

18:30 - 20:00 **Dinner at Hyatt Place**

18:30 - 19:30 Music Performance by Mariachi Pasion, www.mariachipasion.com

19:30 - 19:50 Review of work in the US-Israel Energy Center ICRDE project
Project Directors - Rami Puzis (BGU), Yang Weng (ASU)

20:00 - 21:00 **Poster Session**

Day 1 Adjourn

Day 2, October 10, Tuesday, 09:00-17:00

08:30 - 09:00 **Continental breakfast at Hyatt Place**

09:00 - 09:30 Keynote Speech: Jared Bierbach, Senior International Relations Officer, Office of International Affairs, U.S. Department of Energy

Session 4A: Discussion with Industry Cybersecurity Experts, 09:30-11:00 (19:30 - 21:00 Israeli time)

Panel A: Simulation and Security Assessment in Industrial Control Systems (ICS)

Moderator: Rami Puzis, Ben-Gurion University, Israel

Panelists:

- Aditya Ashok, OPAL-RT Technologies, Canada
- Seth Hoedi, Post Road Foundation, USA
- Harry Thomas, OTORIO, Israel
- Rui Yang, National Renewable Energy Laboratory, USA
- Haim Beltran, Meptagon Group, Israel (zoom connection)

11:00 - 11:10 **Coffee & Tea Break**

Session 4B: Discussion with Industry Cybersecurity Experts, 11:10-12:40 (21:10 - 22:40 Israeli time)

Panel B: Attack Detection and Mitigation

Moderator: Adam Hahn, The MITRE Corporation, USA

Panelists:

- John Geiger, RAD, Israel
- Michael Hylton, Microwave Networks / Partner of SIGA OT, Israel
- Sherry Jacob, Accenture Security, Israel
- Ying-Cheng Lai, Arizona State University, USA
- Mayang Malik, SLAC National Accelerator Laboratory & Stanford University, USA
- Harry Thomas, OTORIO, Israel

12:40 - 13:40 **Lunch at Hyatt Place**

13:20 - 13:40 US-Israel Business Opportunities: A Roadmap for Success
Mara Pernick, President, MGP Consulting

Session 4C: Discussion with Industry Cybersecurity Experts, 13:40-15:10 (23:40 - +1 01:10 Israeli time)

Panel C: Security Assessment and Information Sharing

Moderator: John Dirkman, Resource Innovations, USA

Panelists:

- Francois Detroio, Orthros, Canada
- Adam Hahn, The MITRE Corporation, USA
- Sukarno Mertoguno, Georgia Institute of Technology, USA
- Nadia Saad Noori, University of Agder, Norway
- Dov Shirtz, Ben-Gurion University, Israel (zoom connection)

15:10 - 15:20 **Coffee & Tea Break**

Demonstrations of Company Cybersecurity Solutions, 15:20-17:00 (+1 01:20 - 03:00 Israeli time)

Note: Company representatives are encouraged to prepare slides for presentations and demonstrations. Please notify the workshop management team of your intention to present.

(1) Opal-RT; Hardware-in-the-loop

(2) Resource Innovations; Grid360

Session 5: (Parallel Session) Technical and Budget Discussion of ICRDE project extension

15:30 - 16:30 Tal Fischelovitch (Lead), Daniel Rosenthal, project management team

17:00 - 18:00 **Poster Session**

18:30 - 20:00 **Dinner at ASU Memorial Union**

20:00 - 20:30 **Tour of Professor Yang Weng's Lab on ASU campus**

Day 2 Adjourn

Day 3, October 11, Wednesday, 09:00-12:15

08:30 - 09:00	**Breakfast at Hyatt Place**
09:00 - 09:10	Support from ECEE in Facilitating the ICRDE Project Dr. Stephen Phillips, Director, School of Electrical, Computer and Energy Engineering, ASU

Session 6: Tools for Control and Mitigation of Threats for Achieving Resilience (19:10-20:40 Israeli time)

09:10 - 09:40	Safeguarding Embedded Controllers through Side Channel Analysis Michael Amar, Yossi Oren (BGU)
09:40 - 10:10	SubProcess BFT++: Robust Cyber Attack Resilience for Production Industrial Control Systems Muhammad Faraz Karim, Bo Feng, Sukarno Mertoguno (GIT)
10:10 - 10:40	Heterogeneous reinforcement learning for defending large power grids and commercialization Ying-Cheng Lai (ASU)
10:40 - 10:50	**Coffee & Tea Break**

Session 7: Future-proof Architectures (20:50-21:50 Israeli time)

10:50 - 11:20	Empowering the future: security by design in the energy sector Dov Shirtz, Yuval Elovici (BGU)
11:20 - 11:50	Hardware-in-the-loop for validating algorithms Yeng Wang (ASU), Philippe Bisson (OPAL-RT)

Closing Remarks

11:50 - 12:00	Closing Remarks
12:00 - 13:00	**Lunch at Hyatt Place**

Tour 1: October 11, Wednesday, 13:30-18:00

Tour of nearby attractions (some suggestions)

(Decision on attractions and ride arrangement TBD. Contact the management team if interested.)

- Heard (Native American) Museum, https://heard.org
- Phoenix Art Museum, https://www.phxart.org

Tour 2: October 12, Thursday 07:00 - Thursday 18:00

Tour of the Grand Canyon

(Ride arrangement TBD. Contact the management team if interested.)

- Tentative Schedule: Depart for the Grand Canyon early Thursday morning and return in the evening. This would allow workshop guests to catch their flights (late) Thursday night or Friday.

Workshop URL: https://events.engineering.asu.edu/bird-icrde/

US-Israel Energy Center ICRDE Workshop Management Team

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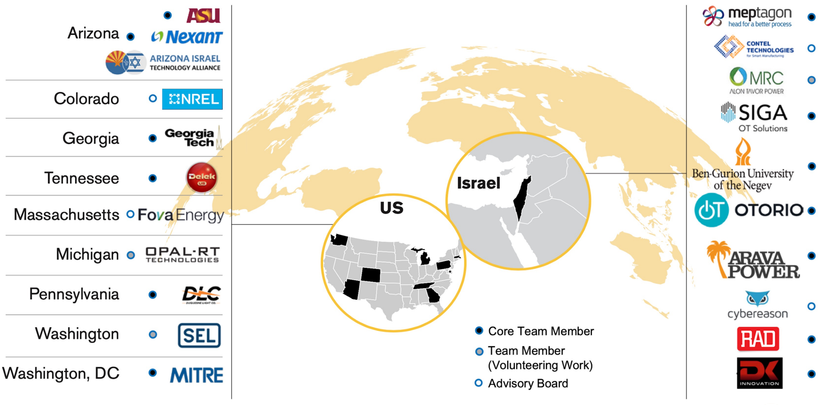

WELCOME TO 2023

US-ISRAEL ENERGY CENTER ICRDE WORKSHOP

CYBERSECURITY RESEARCH AND DEVELOPMENT FOR ENERGY

MEET OUR MEMBERS

Arizona State University

אוניברסיטת בן-גוריון בנגב
جامعة بن غوريون في النقب
Ben-Gurion University of the Negev

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

SLAC NATIONAL ACCELERATOR LABORATORY

MITRE

Pacific Northwest NATIONAL LABORATORY

Stanford University

Georgia Institute of Technology

OPAL-RT TECHNOLOGIES

SEL SCHWEITZER ENGINEERING LABORATORIES

General Electric

SIEMENS

aps

SRP

ARIZONA ISRAEL TECHNOLOGY ALLIANCE

DLC
DUQUESNE LIGHT CO.

resource innovations

OTORIO

MRC
ALON TAVOR POWER

meptagon group

UiA University of Agder

Orthros

RAD
data communications

SIGA
OT Solutions

accenture

Delek US

POST ROAD

Microwave NETWORKS

Fova Energy

cybereason

INNOVATION

MPG Consulting

ARAVA POWER

CONTEL TECHNOLOGIES
for Smart Manufacturing

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