

GOALS

- Argonne National Laboratory's goal is to support CREDC and the U.S. Department of Energy (DOE) in multidisciplinary research and development (R&D) to fulfill the DOE Roadmap's 2020 vision of resilient energy delivery systems (EDS).
- Argonne's specific goal is to provide subject matter expertise in O&G sector outreach and in verification and validation of the R&D security research, framework, models, and tools developed by the CREDC team under the long- and mid-term CREDC R&D goals of resilient EDS.

FUNDAMENTAL QUESTIONS/CHALLENGES

- Why should CREDC research be interested in the security of industrial control systems?
- What are the fundamentally new and different requirements and challenges for implementing the security standards of industrial control systems?
- Securing and maintaining security on legacy industrial control systems that utilize point-to-point communication is one of the biggest challenges. How is the Energy sector addressing the business case to replace these legacy systems in the light of advanced persistent threats?
- Which threat vectors are currently of significant concern to the Energy sector, and is there a need for CREDC to identify new approaches for mitigation?
- How can the Energy sector awareness of these threats be increased under the CREDC project? How can CREDC best achieve industry buy-in?

RESEARCH PLAN

- Argonne will support CREDC through O&G sector-related research, outreach, and technical support to achieve the goals of the project.
- Argonne will coordinate with O&G sector-related entities to verify and validate relevant theories and assumptions used to support the CREDC research and development of security solutions.
- Argonne will provide technical and subject matter expertise on research, participation in CREDC team meetings, and other support as applicable to achieve the goals of the research.
- Argonne will coordinate with O&G sector-related entities to provide up-to-date and relevant EDS security-related practices for use in the CREDC research and solution efforts.
- Argonne will actively participate, both directly and through industry outreach efforts, in annual stakeholder workshops conducted in the pursuit of CREDC goals.

RESEARCH RESULTS

Argonne will provide review and verification/validation of the CREDC work as applicable to the oil and gas sector in terms of research excellence, solutions, pilot deployment, training, and outreach. The CREDC research focus is outlined below:

- *Research excellence:* scientific and engineering leadership in EDS cybersecurity innovation, influential publications, graduates who assume engineering and leadership positions in industry and academia.
- *Demonstrate and transition solutions addressing critical sector needs:* validated in realistic environments, at test facilities in the partner institutions and/or at industry sites.
- *Workforce development in EDS cybersecurity:* through industry outreach such as workshops and focused training activity, with the aim of developing security/resiliency engineering professionals in EDS.
- *Advancing the culture of security:* through research, outreach, and education efforts. The CREDC impact will increase the level of security awareness among industry personnel at all managerial and workplace levels, as well as in the general public.

BROADER IMPACT

- Increased awareness by the Energy sector and by the public of the current capabilities and challenges of the Oil and Gas sector vis-à-vis cybersecurity exposure.
- Identifying areas for future cybersecurity research on next-generation operational technology specific to the Oil and Gas sector, beyond the scope of this project.
- Identifying areas of education and workforce training efforts in advancing the culture of security.
- Develop closer working relationships within the Energy sector with the objective of mutual cooperation vis-à-vis increasing awareness and outreach on EDS security research.

INTERACTION WITH OTHER PROJECTS

- Argonne will reach out to CREDC and Energy sector industry partners on other research projects found to be exploring developments in relevant areas, as identified under CREDC's and the Energy sector's industry partners' objectives. A primary objective of such outreach is to facilitate an exchange of information, if such an exchange is mutually beneficial.
- Argonne will make CREDC aware of any existing or proposed research and solutions or findings with relevance to EDS and provide appropriate support to the CREDC team.

FUTURE EFFORTS

- Over the life of CREDC, Argonne will continue to provide support with subject matter expertise in industry outreach, verification/validation of cybersecurity research, development of solutions, and training to help accomplish the main objective of the U.S. Department of Energy Roadmap's 2020 vision of resilient energy delivery systems.