Tactical Risk Reduction in IACS Environments

(AKA: Assessing adversary opportunities in critical infrastructure)

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- Masters Degree in Information Assurance
- IACS Security Program Maturity
- IACS Security Assessments
- Penetration Testing
- Security Research

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Agenda

- ISA/IEC-62443 Risk Assessments
- Strategic Vs Tactical Vulnerability Assessments
- Adapting the CutSec Cyber Vulnerability Assessment Methodology
- Cyber Vulnerability Assessment Reports
- Summary

ICS62443 Risk Assessments - Requirement

- ISA/IEC–62443-3-2: Security risk assessment for system design
  - Perform a detailed cyber security risk assessment
    - Identify threats
    - Determine Consequence and Impacts
    - Identify vulnerabilities
    - Determine unmitigated likelihood
    - Determine unmitigated cybersecurity risk
    - Determine Security Level Target (SL-T)
    - Compare unmitigated risk with tolerable risk
    - Identify and evaluate existing countermeasures
    - Re-evaluate likelihood and impact considering countermeasures
    - Determine residual risk
    - Compare residual risk with tolerable risk
    - Apply additional security countermeasures
    - Document and communicate results

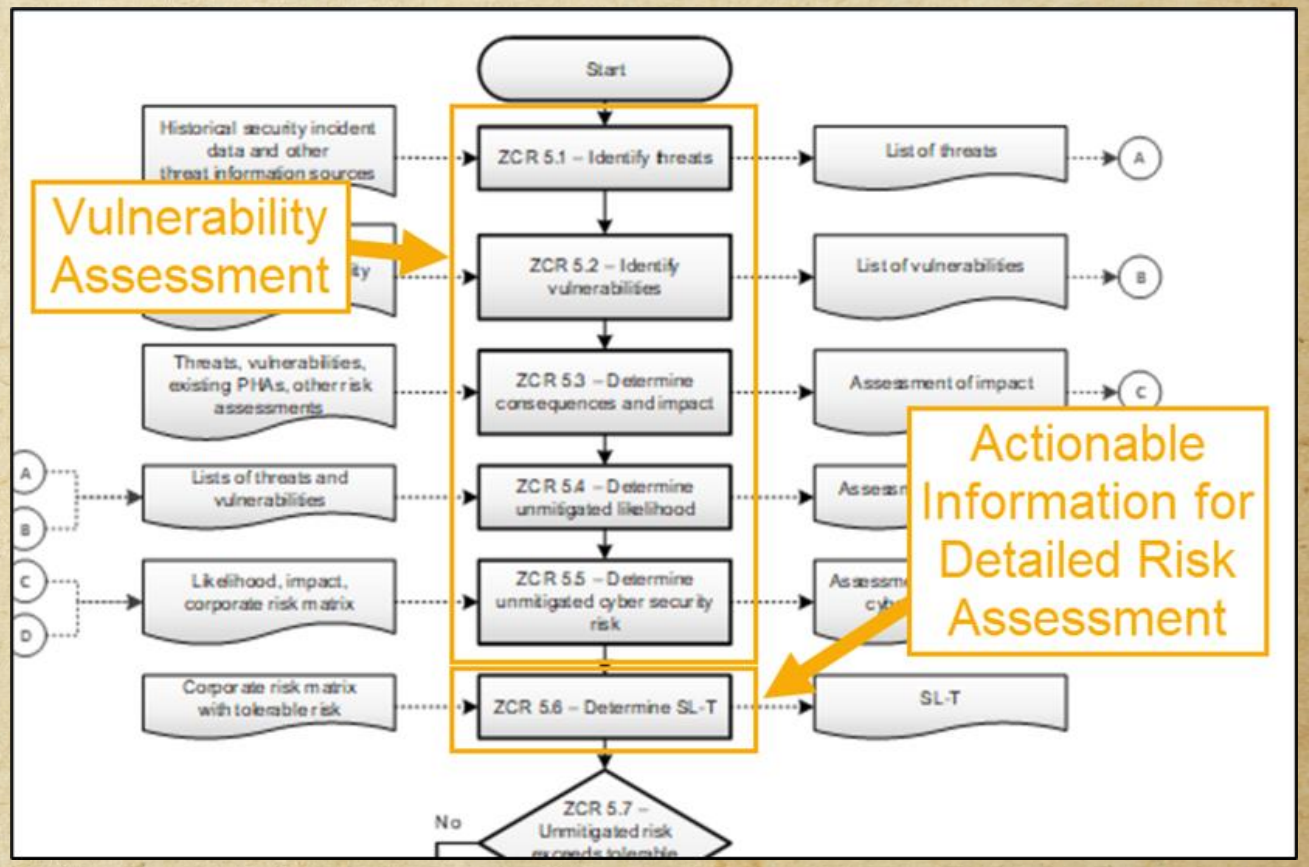

Image Source: White Paper Excerpt: Leveraging ISA 62443-3-2 For IACS Risk Assessment and Risk Related Strategies

ICS62443 Risk Assessments - Implementation

- ISA/IEC-62443-3-3: System security requirements and security levels
  - Foundational Requirements (FRs)
    - Identification and authentication control (IAC)
    - Use control (UC)
    - System integrity (SI)
    - Data confidentiality (DC)
    - Restricted data flow (RDF)
    - Timely response to events (TRE)
    - Resource availability (RA)
  - Security Levels
    - SL 1 – … protect against casual or coincidental access by unauthenticated
    - entities.
    - SL 2 – … protect against intentional unauthenticated access by entities using simple means with low resources, generic skills and low motivation.
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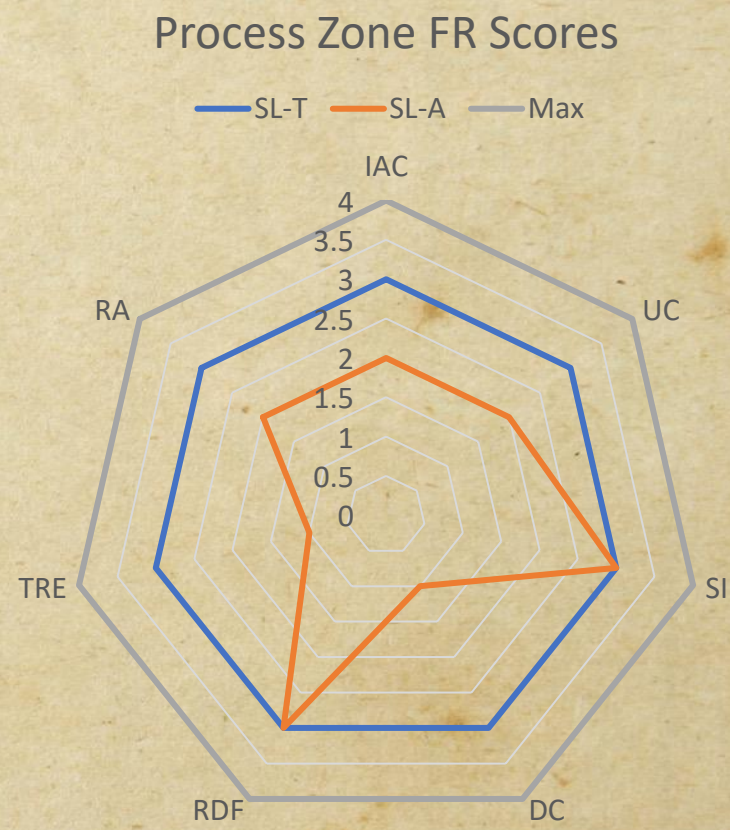


Questions That Remain

- How do I safely gather cyber information about my process?
- How do I safely do a cyber security penetration test?
- What are these people going to be doing to my process?
- Fine, they find vulnerabilities, now what?
- Why don’t you just tell me what to do?

Strategic VS Tactical - Simplified

- Strategic decisions are designed to affect and affirm culture and address systemic issues.

- Tactical decisions directly impact the implementation of the physical processes.

Image Source: https://sprigghr.com/blog/alignment-direction/strategy-vs-tactics-how-do-they-work-together/

Types of Cybersecurity Vulnerability Assessments

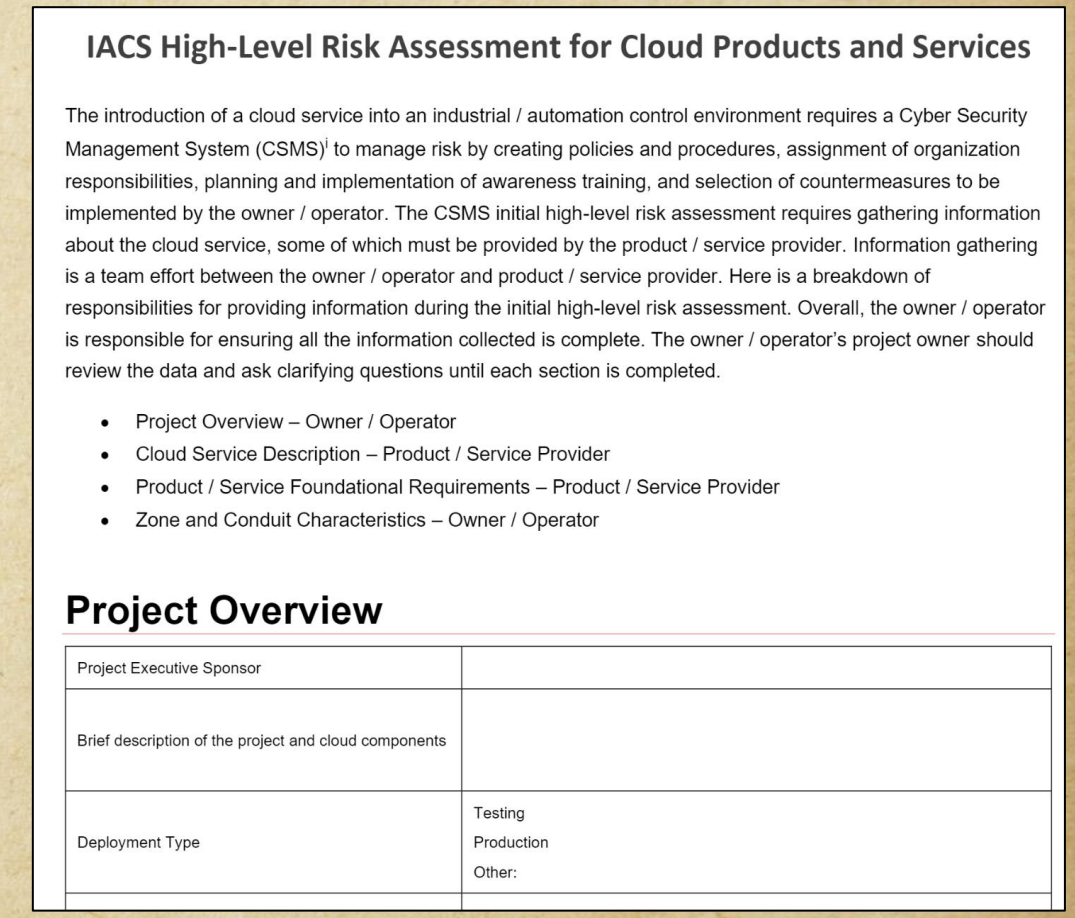
- Defining and communicating types of assessments reduces confusion
- Select assessment types based on the organization's goals
- Risk and cost vary by goals and experience
- Assessment results should improve process operational requirements

Project Initiation Data + Vendor Review = High-Level Risk Assessment

OT Risk	Assessment Type	Estimated Cost
	Vendor Review	$
	Security Research	$ $
	Threat Modeling	$ $
☢	Security Assessment	$ $ $
☢ ☢	Security Program Maturity	$ $ $
☢ ☢ ☢	Penetration Test	$ $ $
☢ ☢ ☢ ☢	Red Team	$ $ $ $

IACS Challenges: The Cloud

- OT Teams do not have questionnaires to evaluate cloud deployments, third-party administration, data flow, and vulnerability management.
- Vendors may or may not have conducted third-party web application and API testing.
- How are they managing administrative roles / responsibilities and access monitoring?
- OT teams are NOT cloud experts.



IACS High-Level Risk Assessment for Cloud Products and Services

The introduction of a cloud service into an industrial / automation control environment requires a Cyber Security Management System (CSMS)[i] to manage risk by creating policies and procedures, assignment of organization responsibilities, planning and implementation of awareness training, and selection of countermeasures to be implemented by the owner / operator. The CSMS initial high-level risk assessment requires gathering information about the cloud service, some of which must be provided by the product / service provider. Information gathering is a team effort between the owner / operator and product / service provider. Here is a breakdown of responsibilities for providing information during the initial high-level risk assessment. Overall, the owner / operator is responsible for ensuring all the information collected is complete. The owner / operator's project owner should review the data and ask clarifying questions until each section is completed.

- Project Overview – Owner / Operator
- Cloud Service Description – Product / Service Provider
- Product / Service Foundational Requirements – Product / Service Provider
- Zone and Conduit Characteristics – Owner / Operator

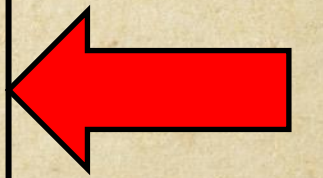
Project Overview

Project Executive Sponsor	
Brief description of the project and cloud components	
Deployment Type	Testing Production Other:

CutSec CloudSec-IACS:
https://github.com/cutaway-security/CloudSec-IACS

IACS Cyber Vulnerability Assessment Effort Prioritization

- Physical Security
- Segmentation and Isolation
- Access Control / Authorization
- Attack Surface
- Logging and Monitoring
- Asset Inventory
- Incident Response and Recovery

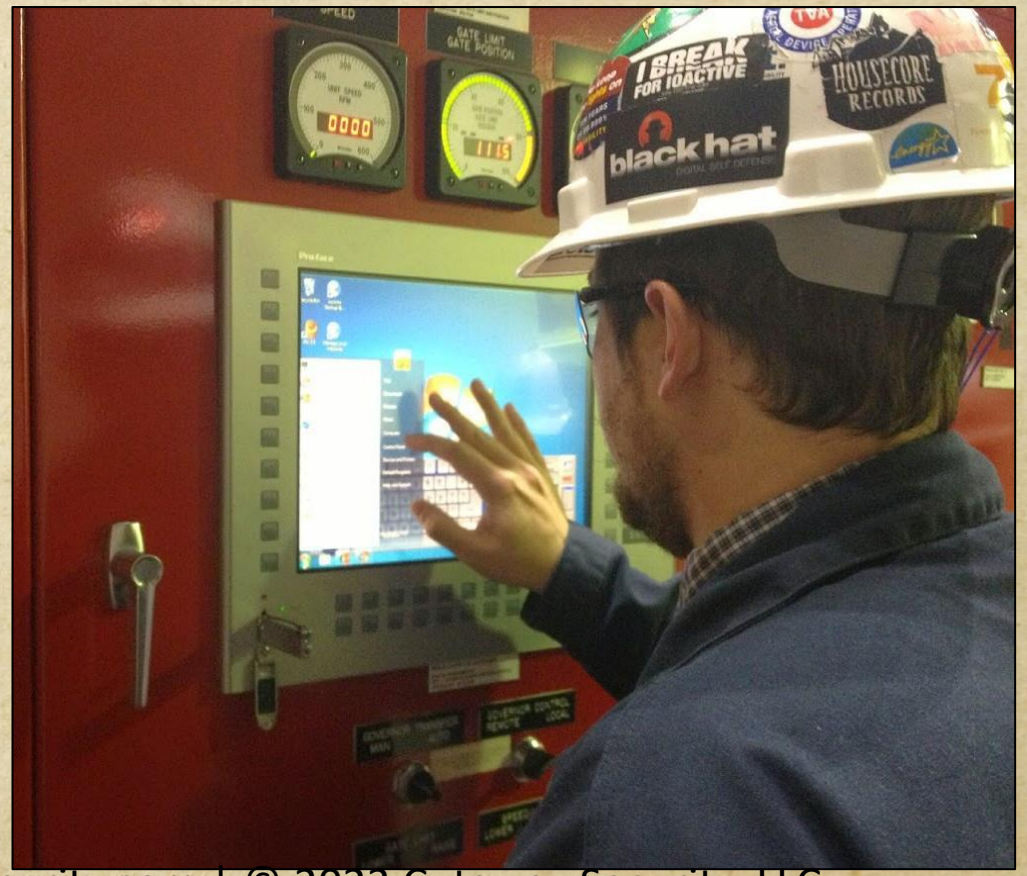


Tactical IACS Security Starts Here

Vulnerability Analysis Via Process Familiarization

Taught to me by two major, unrelated, Electrical Utilities

- Remote Scoping
  - Architecture Review
  - Basic Adversary Opportunity Models/ Use Cases
  - Test Plan
- On-site
  - Site Walk Thru
    - Physical Security
    - Engineer / Operator Actions in Process
  - Interviews
    - Managers
    - Engineers / Operators / Programmers
    - IT Team
    - IT Security
  - Network Traffic Capture and Analysis
  - Attack Surface Enumeration
    - Network
    - System / Device Configuration
  - Asset Management
- Remote Reporting



ISA/IEC-62443 Vulnerability Assessment Types

- Remote Scoping
  - Architecture Review
  - Basic Adversary Opportunity Models/ Use Cases
  - Test Plan

High-Level

- On-site
  - Site Walk Thru
    - Physical Security
    - Engineer / Operator Actions in Process
  - Interviews
    - Managers
    - Engineers / Operators / Programmers
    - IT Team

Passive

- Network Traffic Capture and Analysis
- Attack Surface Enumeration
  - Network
  - System / Device Configuration
- Asset Management

Active

- Remote Reporting

MOST IMPORTANT

Cyber Assessment Reports

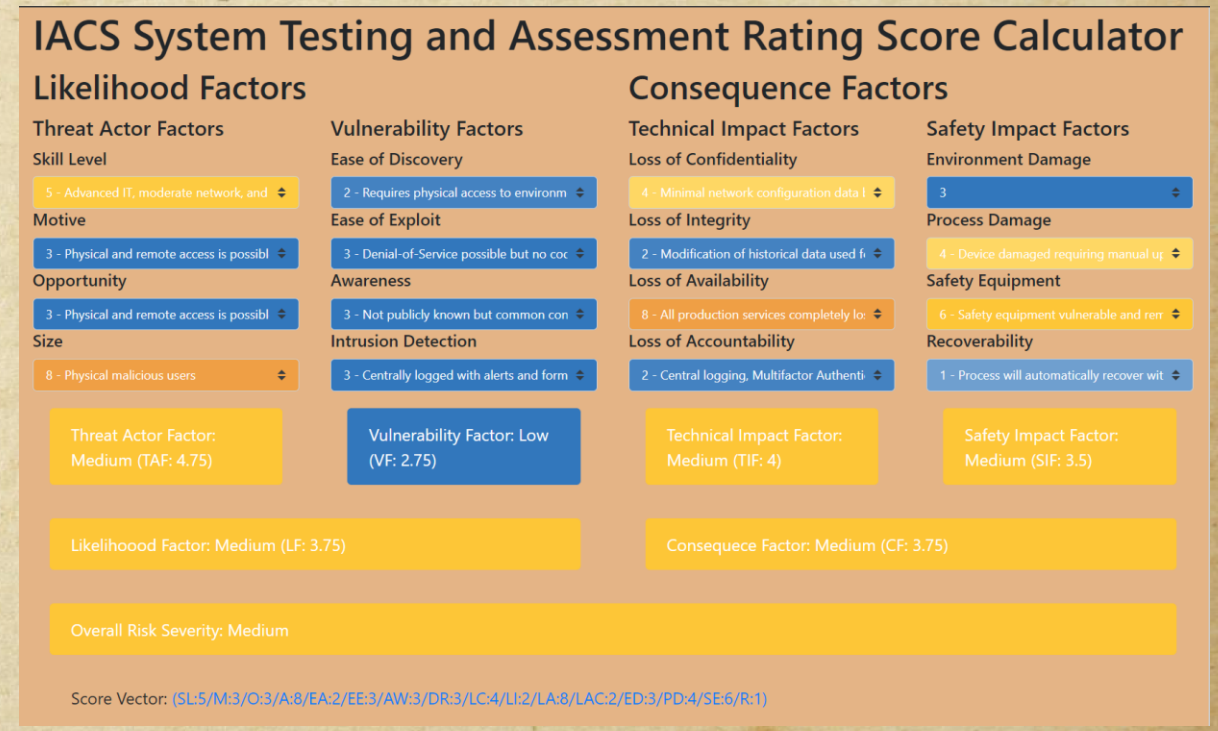
Taught to me by two major, unrelated, Electrical Utilities

- Traditional Assessment Report
  - Executive Summary
  - Scope
  - Methodology
    - Detailed Activity Log
  - Findings
    - Observation
    - Risk
    - Recommendations
  - Summary / Conclusion
  - Supporting Data

- IACS Cyber Assessments
  - Activity Log
    - Secondarily provides details about assessment activities.
    - Primarily provides details about activities that made changes or left artifacts. For clean-up.
  - Findings
    - Observation
    - Risk
    - Consequences
    - Recommendations

IACS Challenges: Rating / Discussing Risk

- MITRE ICS ATT&CK Impacts are different than corporate impacts.
- IT / Infosec Teams need to be experienced in talking about work-arounds and risk acceptance when it comes to new vulnerabilities.
- Risk is often tied to compliance. However, compliance DOES NOT equal security.
- One work-around or patch might require recertification of the whole line / process. $$$



CutSec IACS System Testing and Assessment Rating Methodology (IACS STAR):
https://github.com/cutaway-security/IACS_STAR_Methodology

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ICS62443 Risk Assessments - Strategic

- ISA/IEC-62443-3-3: System security requirements and security levels
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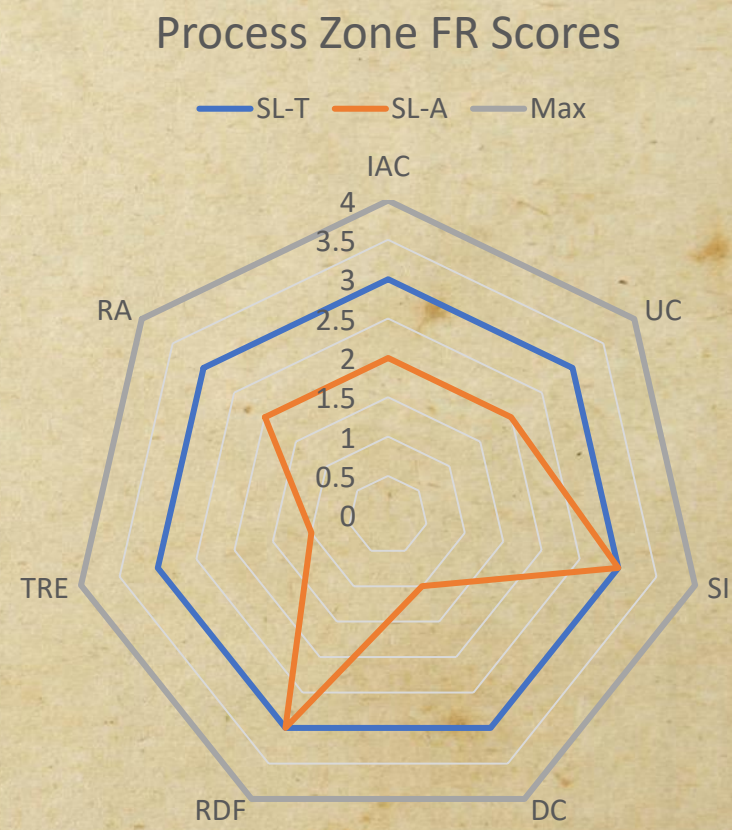

Distribute Cyber Vulnerability Assessment Reports

- Identify Partner Organizations to Share Reports
  - ISACs / Munis / Co-ops?
- For Each Cyber Assessment
  - Generate a sanitized report of findings and recommendations
  - Distribute to other business units / process owners in your organization
  - Distribute to partner organizations
- Receiving Sanitized Cyber Assessment Reports
  - Distribute to other business units / process owners in your organization (quarterly?)
  - Require leaders to review assessments with their teams and provide summary of comments or actions taken

Summary

- Tactical Vulnerability Assessments help teams become familiar with the cyber security risk assessment process.
- Tactical Vulnerability Assessments are designed to QUICKLY identify gaps for teams to plan with vendors / integrators.
- Tactical Vulnerability Assessments feed information into the ISA/IEC-62443 Detailed Risk Assessment.
- Risk Assessments MUST still be performed after the Vulnerability Assessment and should be done following the ISA/IEC-62443 standards.
- Distribution and review of sanitized reports are like a FREE Vulnerability Assessment.

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