DNV

SMART GRID FORUMS

Understanding IEC 62443

Aligning IEC 62443 concepts, frameworks and controls with the cybersecurity risk of your power grid organisation

Webinar: 16:00-17:00 CET

Wednesday 27th October 2021

Crowdcast Webinar Platform

Christian Nerland, Mirnes Alic
DNV Cyber Security, Norway

27 October 2021

Understanding IEC 62443 - Introduction

1. Increasing threat landscape
2. Cyber security for the Real world
3. Holistic Cyber Security
4. Starting early will pay-off
5. Recommended practices

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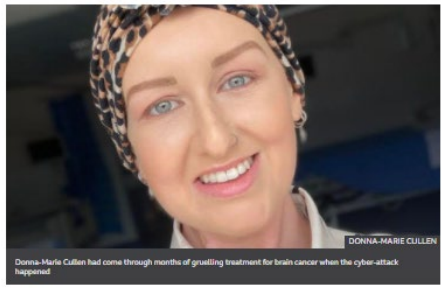
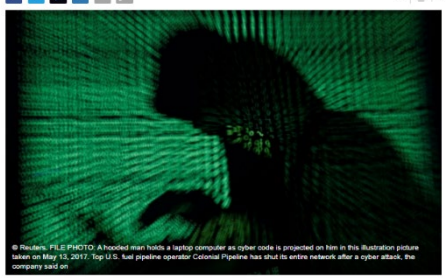
Increasing threat landscape – Impact is getting real..

HSE cyber-attack: Irish health service still recovering months after hack



Donna-Marie Cullen had come through months of gruelling treatment for brain cancer when the cyber-attack happened

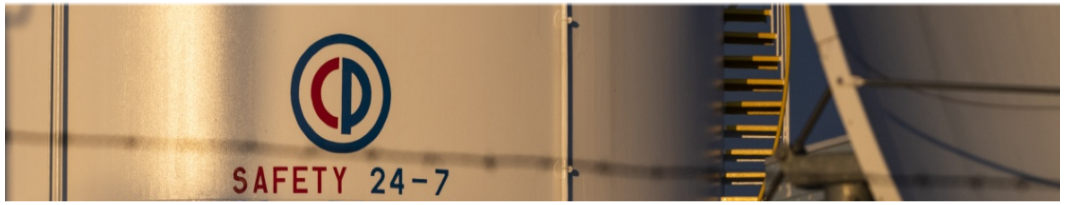
Cyber attack shuts down U.S. fuel pipeline 'jugular,' Biden briefed



Technology

SolarWinds says dealing with hack fallout cost at least $18 million

By Raphael Satter



Cybersecurity

Hackers Breached Colonial Pipeline Using Compromised Password

By William Turton and Kartikay Mehrotra

4. juni 2021, 21:58 CEST

- Investigators suspect hackers got password from dark web leak
- Colonial CEO hopes U.S. goes after criminal hackers abroad

LISTEN TO ARTICLE

▶ 4:58

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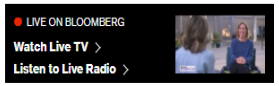
The hack that took down the largest fuel pipeline in the U.S. and led to



CYBER SECURITY FOR THE REAL WORLD

27 October 2021

The OT/ CPS maturity journey

60% of orgs. are here

30% of orgs. are here

Decision point

10% of orgs. are here

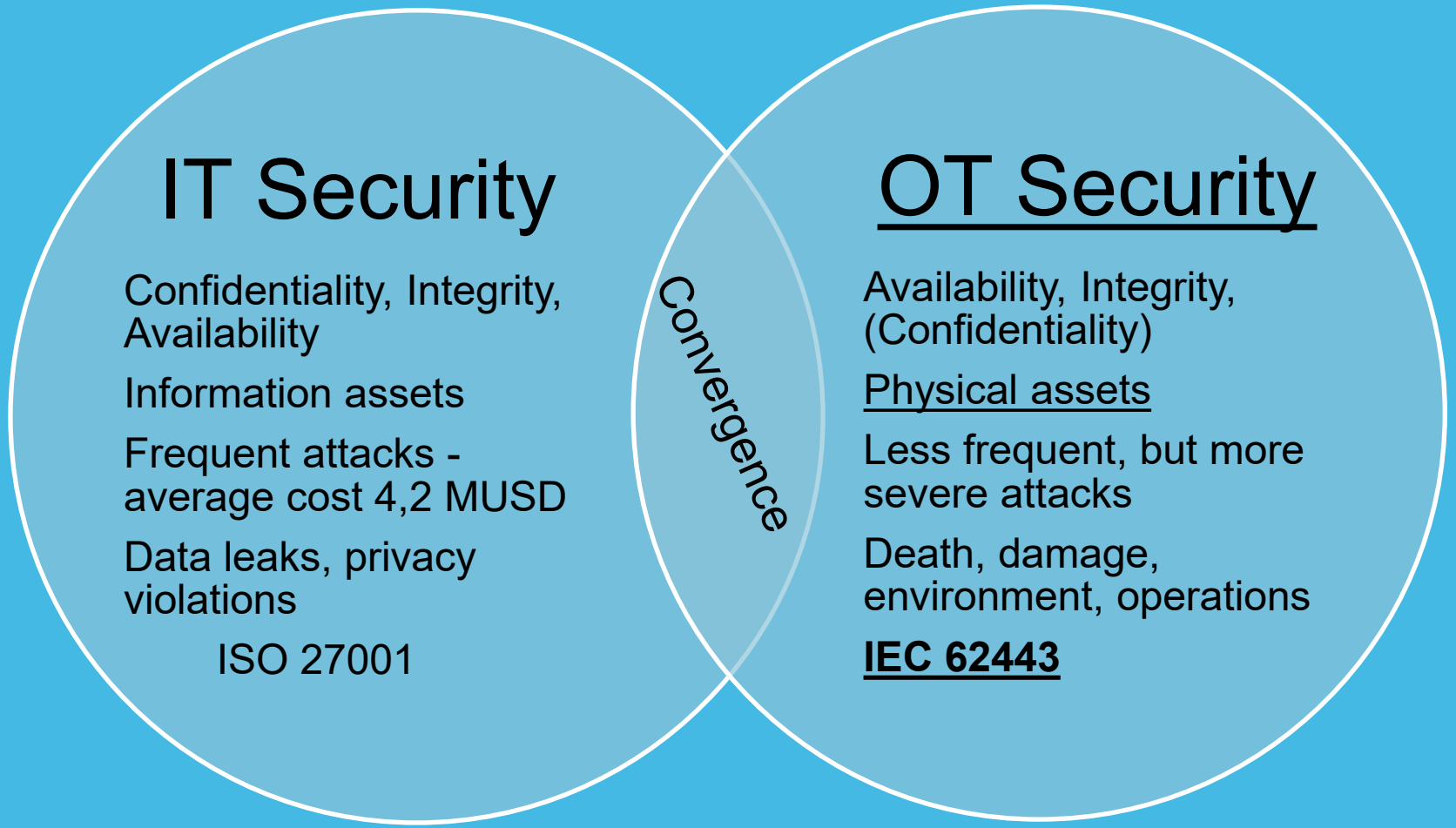
Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Awareness	**Outreach / asset discovery / network topology mapping**	**Understanding the severity**	**Firefighting**	**Integration**	**Optimization**
• Driven by: • Breach • Board of Directors / C-Suite • Government Bulletins • Government Intervention	• Internet outreach to understand current OT security governance • Proof of concept with OT security platform vendors	• Unmanaged devices connecting everywhere! • OT network isn't segmented! • Open ports everywhere! • OEM remoting in without a policy! • Windows XP everywhere! • Cybersecurity, physical security, supply chain security, HS&E and product security teams do not talk!	• Steering Committee/Org realignment • Focus on high value assets • Deployment of best POC solution • Network segmentation • Patching or compensating controls	• Creation of a Chief Security Officer to converge siloed security disciplines • OT security platform data feed to SIEM/SOAR/central SOC • Best of breed policy updates	• Shift to ORM (Operational Resilience Management) • Realization that a lot of the OT data gathered for security purposes also have operational, engineering, maintenance, compliance, procurement or C-suite reporting value

Source. Gartner 01.25.21

Increasing OT Robustness

DNV

Holistic cyber security



People | **Process** | **Technology**

Cyber Security – starting early will pay off!

- **Early involvement on Cyber Security is key**
  - To identify and clarify consequences for concept and early FEED decisions
  - To make sure relevant requirements are included towards all stakeholders

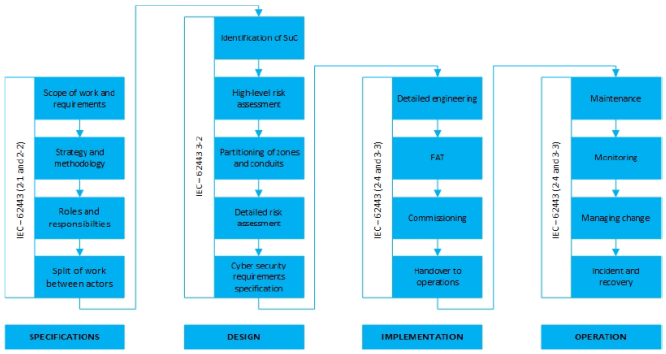
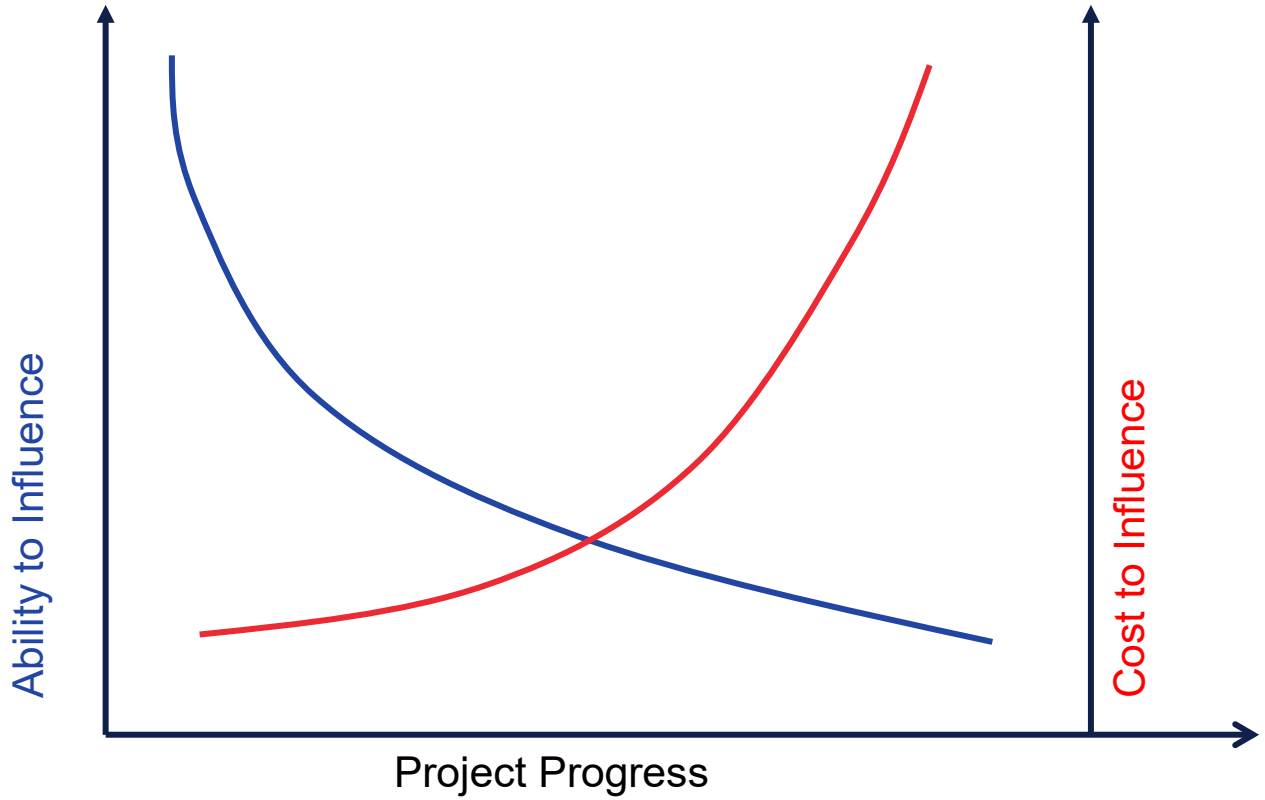
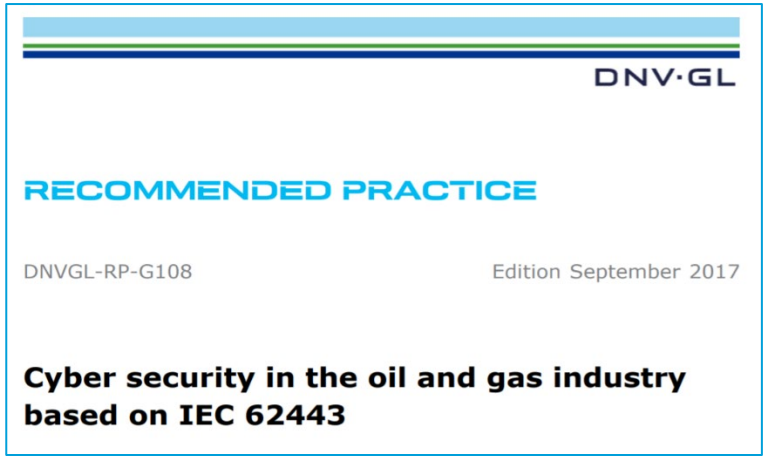


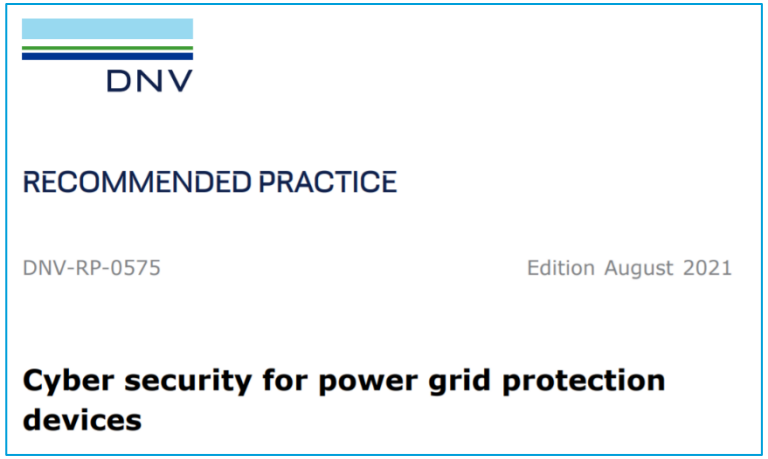
Figure 4-3 Cyber security during the substation lifecycle



Source: DNV-RP-0575 - Cyber security for power grid protection devices

Recommended practices



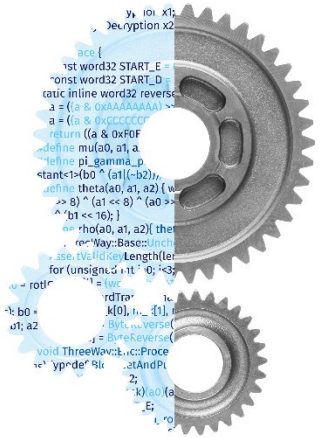


DNV RP G-108	Cyber security in the oil and gas industry based on IEC 62443 https://rules.dnv.com/docs/pdf/DNV/RP/2017-09/DNVGL-RP-G108.pdf
DNV RP 0576	Cyber security for power grid protection devices https://rules.dnv.com/docs/pdf/DNV/RP/2021-08/DNV-RP-0575.pdf
Energy Academy	Two-day training course to improve the cyber security of your OT network by using IEC 62351 devices and implementations. https://www.dnv.nl/training/training-course-on-cyber-security-189292

Applying IEC 62443

Know your cyber risks

Build a powerful force of defence



Win stakeholder support

We will talk about …

- Exposure in Power Grid
- Applying IEC 62443
- Case study: Ukranian Power Grid

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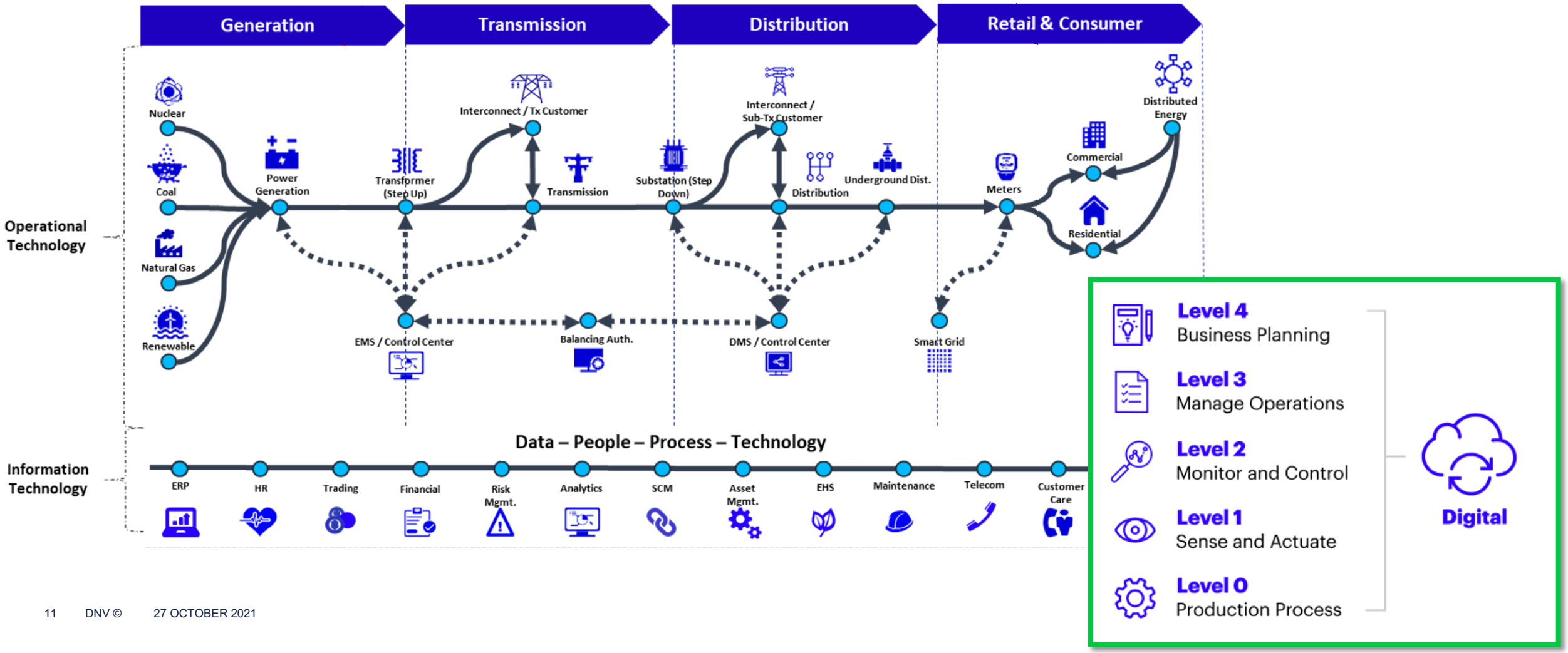
The Exposure



Where to apply cyber security in utilities/grid operations

C = Confidentiality
I = Integrity
A = Availability

S = Safety
A = Availability
I = Integrity
C = Confidentiality

Office

IT

IT for OT

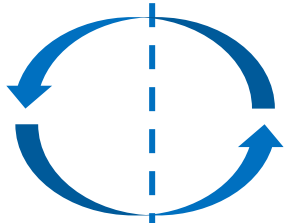
Grid/Plant Operations

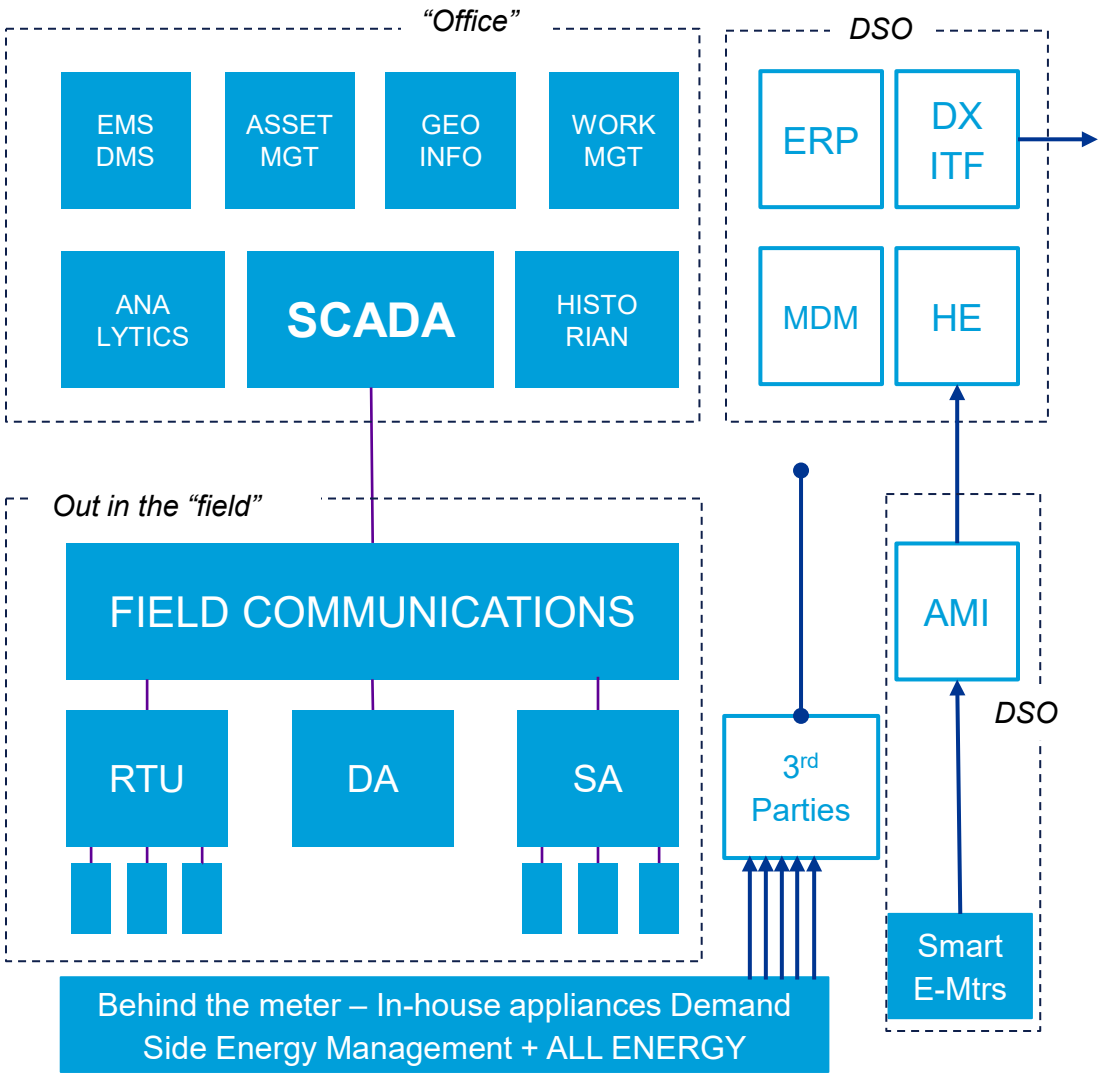
Wireless

Cloud

OT + "IoT"

Grid/Plant Processes





Applying utility cyber security standards

IT Systems
ISO 27001(x)

OT Systems
IEC 62443

Process Controls
IEC 62443-2-1

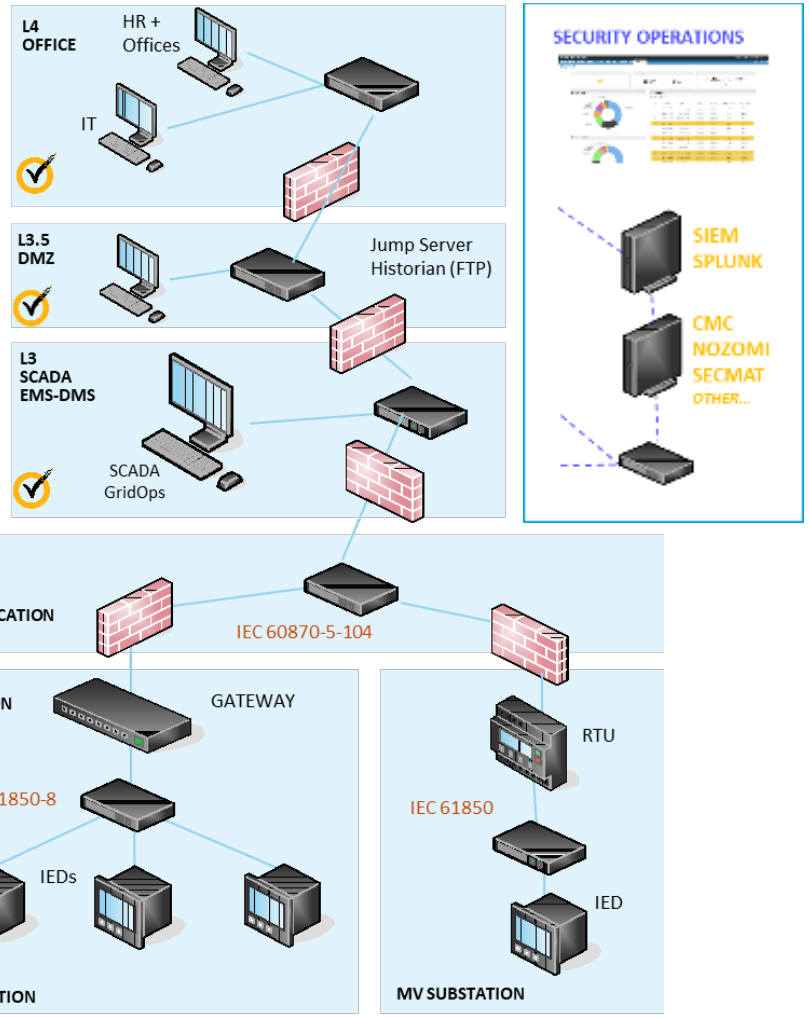
Tech. Security Levels
IEC 62443-3-3

Prot. + IED Security
IEC 62351

Grid Operations
Network/System Operators – Utilities
Portfolio Managers – Power Producers

SCADA + GridOps Systems
Secure System Architectures
Remote Control – Remote Access

SCADA Protocols
ICCP
IEC-101/104
IEC 61850
IED's



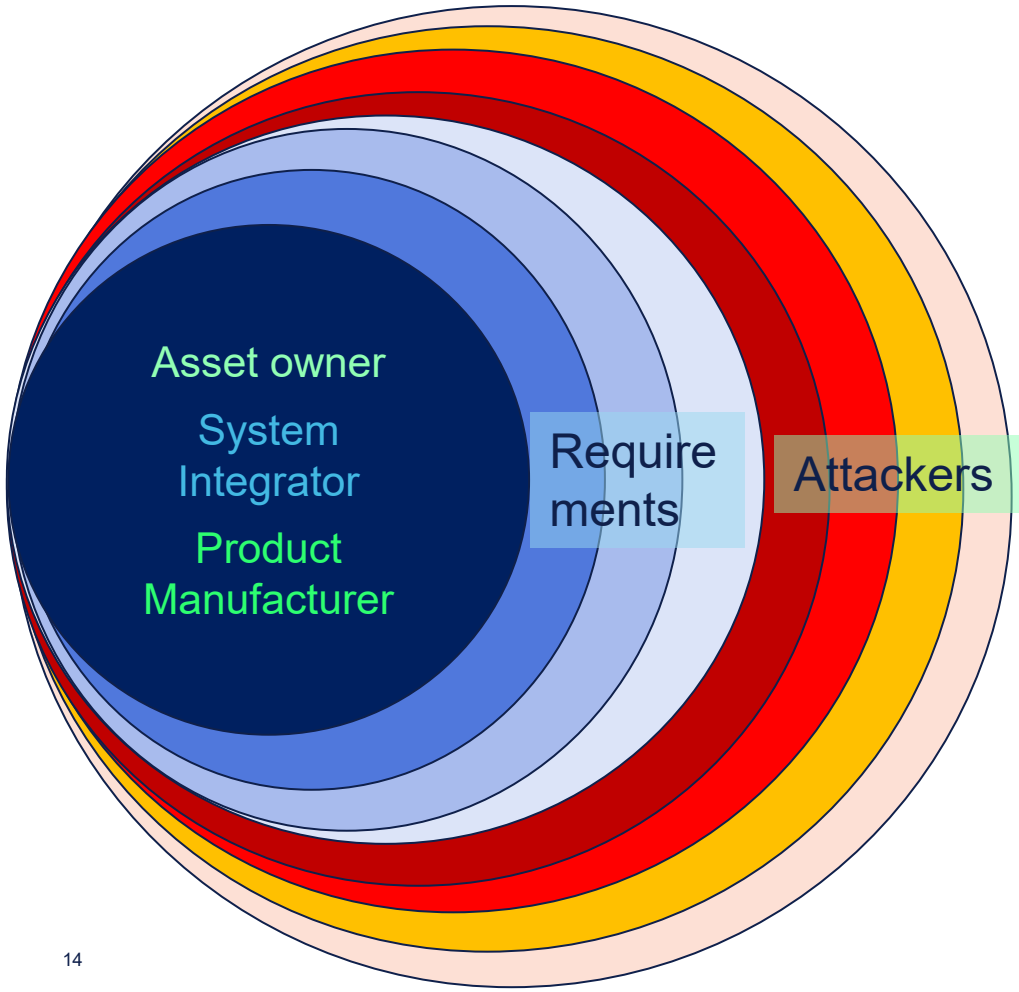
Add Power Generators:

- Large – DCS + SCADA connected to TSO
- Windmills (parks) – DER
- Solar (fields)

Add Smart Metering + Comms Infra

Add ICCP – TSO-TSO-RSC + DSO-TSO

IEC 62443



Asset owner

System Integrator

Product Manufacturer

Requirements/Controls

SL 1 2 3 4

Accident

Low skill

Moderate skill

Advanced threat

CSMS

RA

Defence-in-depth

Zones and Conduits

Security Levels

Critical Assets

Device Security

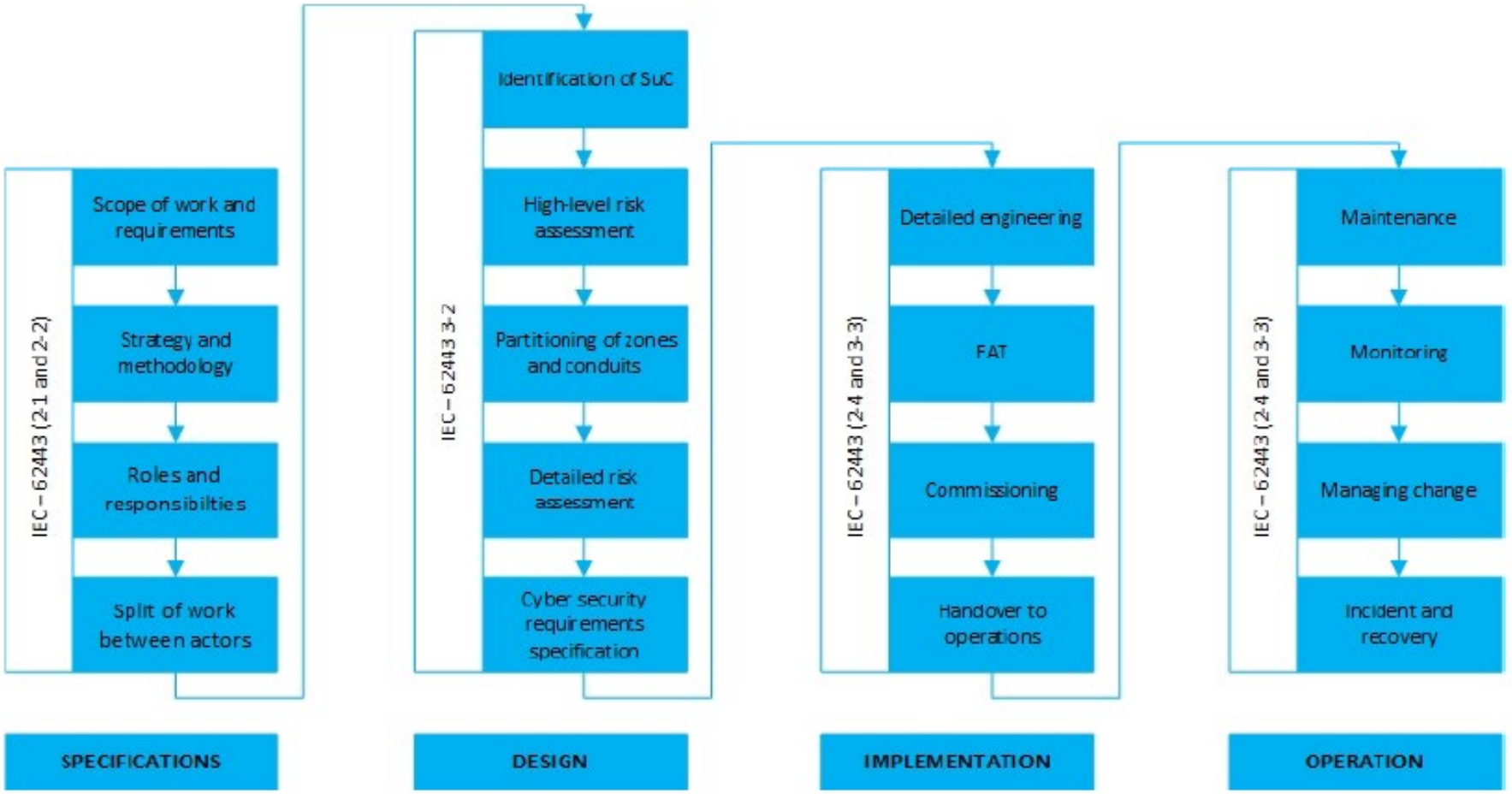
Visibility

Response

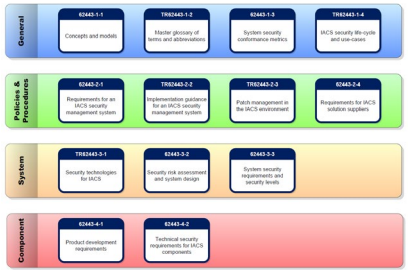
Human Factor

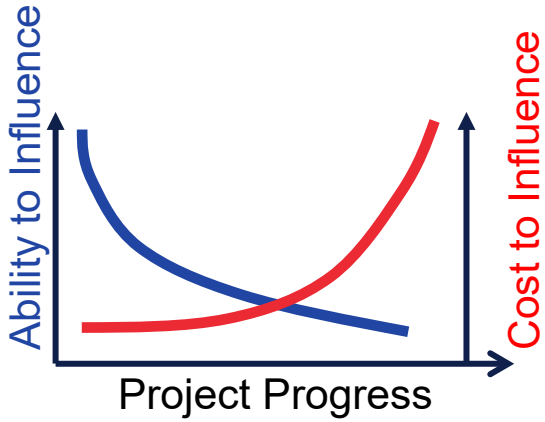
Supply Chain

IEC 62443 in project lifecycle



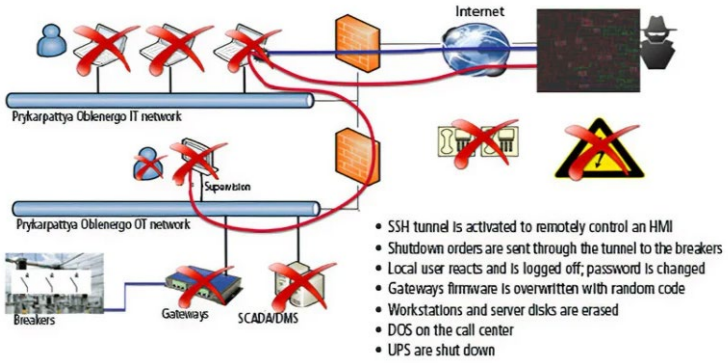
IEC 62443 chapters





Source: DNV-RP-0575 - Cyber security for power grid protection devices

Ukraine power grid attack through eyes of IEC 62443



3 steps:

1) Email phishing and C2

2) Recon IT / OT, enumeration, vulnerable devices, lateral movement, credential harvesting, becoming invisible, clean-up

3) Launch (attack duration 10 minutes)

Missing controls according to IEC 62443

FR	FR title	SR	SR title	SL1	SL2	SL3	SL4	Assessed SR
1-IAC	Identification and authentication control	1.1	Human user identification and authentication					FR1 = 0
1-IAC	Identification and authentication control	1.2	Authenticator feedback					
1-IAC	Identification and authentication control	1.3	Access via untrusted networks					
2-UC	Use control	2.1	Authorization enforcement					FR2 = 0
2-UC	Use control	2.4	Mobile code					
2-UC	Use control	2.6	Remote session termination					
2-UC	Use control	2.8	Auditable events					
2-UC	Use control	2.9	Audit storage capacity					
2-UC	Use control	2.11	Timestamps					
3-SI	System integrity	3.2	Malicious code protection					FR3 = 0
3-SI	System integrity	3.9	Protection of audit information					
4-DC	Data confidentiality	4.1	Information confidentiality					FR4 = 0
5-RDF	Restricted data flow	5.1	Network segmentation					FR5 = 2
5-RDF	Restricted data flow	5.2	Zone boundary protection					
5-RDF	Restricted data flow	5.3	Person-to-person communication restrictions					
5-RDF	Restricted data flow	5.4	Application partitioning					
6-TRE	Timely response to events	6.1	Audit log accessibility					FR6 = 1
6-TRE	Timely response to events	6.2	Continuous monitoring					
7-RA	Resource availability	7.3	Control system backup					FR7 = 0
7-RA	Resource availability	7.4	Control system recovery and reconstitution					
7-RA	Resource availability	7.5	Emergency power					
7-RA	Resource availability	7.7	Least functionality					

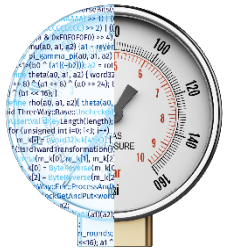
https://blog.isa.org/lessons-learned-forensic-analysis-ukrainian-power-grid-cyberattack-malware

DNV and IEC 62443

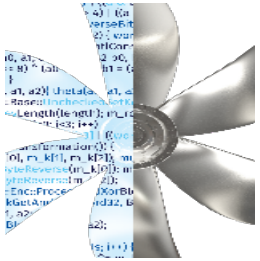
- Work with all stakeholders (asset owners, integrators, manufacturers)
- Draws from experience in different sectors
- Cyber Security Management System
- Risk assessment
- System and component testing and certification (IEC 62443 and IEC 62351)
- Training (IEC 62351 – DNV Energy Academy and IEC 62443)

  Two-day training course to improve the cyber security of your OT network by using IEC 62351 devices and implementations. https://www.dnv.nl/training/training-course-on-cyber-security-189292
- CyberGym Collaboration

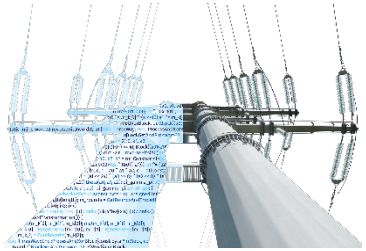
DNV cyber security market segments



Oil and gas

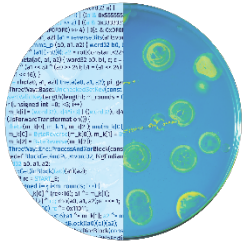


Maritime

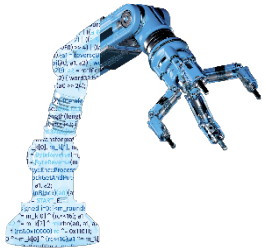


Electricity infrastructure & distribution

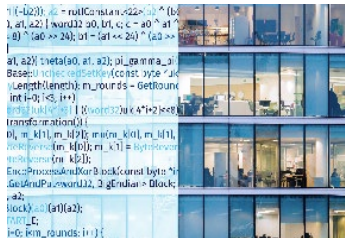
Renewables



Healthcare



Manufacturing



Public sector

Financial services