Utility Trends and Cisco Solutions Overview

October 2023


Our mission:
To sustainably and securely connect innovation platforms for the worlds most critical infrastructure.

New demands on the network

Utility networks are becoming more digitised and automated, but digitisation isn't easy.

- Physical and cyber security threats
- Increased bandwidth requirements
- Need to future proof technologies
- High degree of timing synchronisation required
- Need for simplicity and efficiency

Here's what utilities partners are saying…

Renewables

67% of customers said that Distribution Automation for renewables is their most important business concern in the next three years

Investments

The biggest investments are focused on Grid Infrastructure: Security, the transition from serial to IP, and digitization

Security

1. Threat containment
2. User identity
3. Device visibility

Constraints

Lack of in-house expertise is the #1 constraint, followed by the lack of industry-proven deployments and regulatory processes


Why Cisco?
We've worked with over 19,411 utility companies in 163 countries worldwide
We're a trusted leader in industrial networking and automation
1
We understand IT and OT (and their convergence)
2
We understand the technical complexities of renewable generation
3
We understand that industrial security requires more than OT segmentation

Two worlds ~~colliding~~

Two worlds ALIGNING

IT + OT partnership is critical to success

"OT knows why we need to digitize a process.
IT knows how to digitize a process"

Nicholas Bally – IT-OT Business Developer, NXO

OT networks can benefit from enterprise capabilities

Helping to avoid:

Less secure, unsegmented

Evolving threats

Air gapped, unsegmented or flat Layer-2 networks

Lack of asset visibility

Complexity at scale

Multiple vendors and networks

Multiple touch points

Multi-step, complex interactions

Difficulty resolving issues

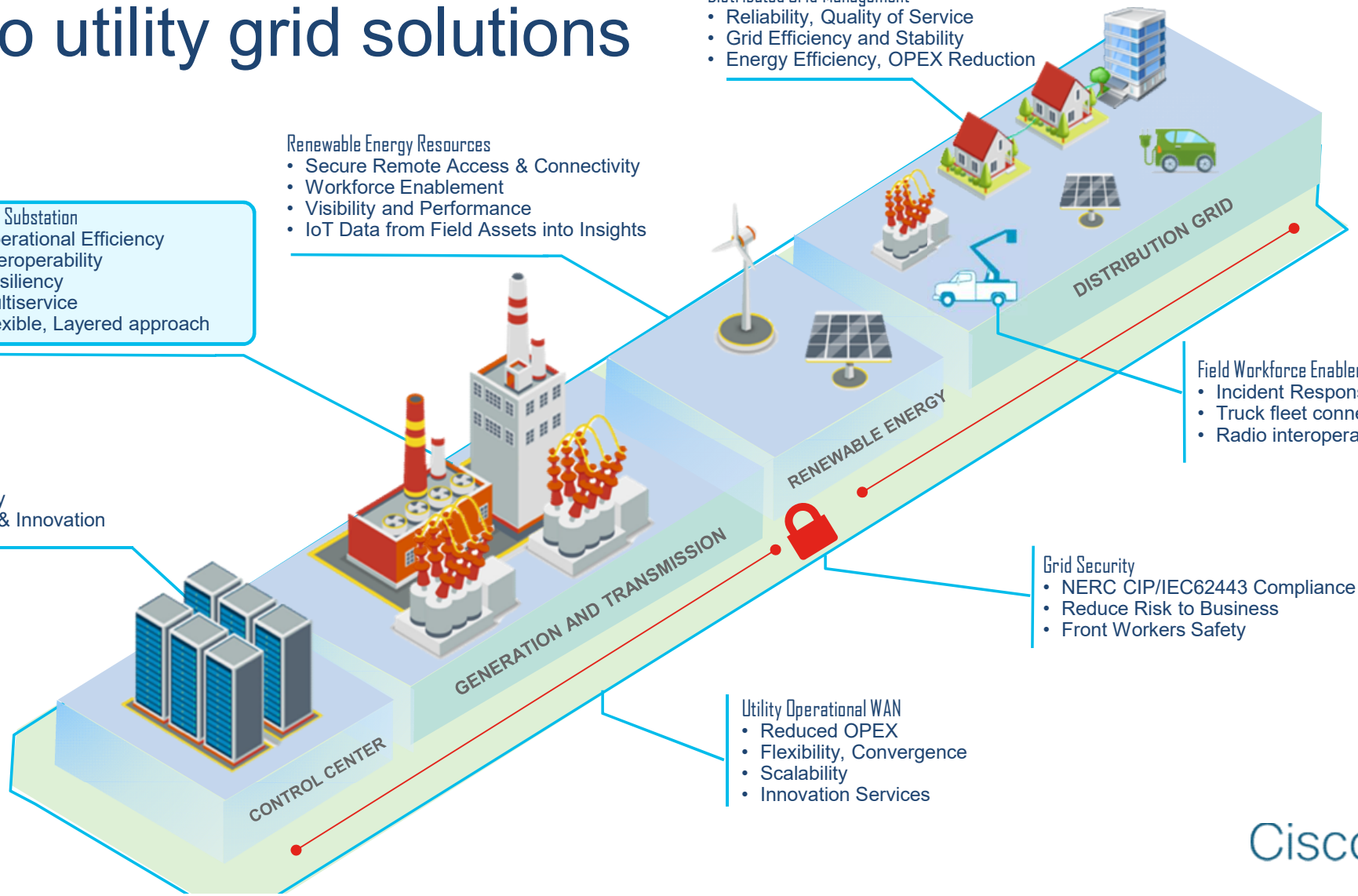
Poor network visibility

Long outages due to reactive troubleshooting

Manual processes

Talent shortages compound the issue – IT/OT need enterprise capabilities to keep up

Cisco utility grid solutions

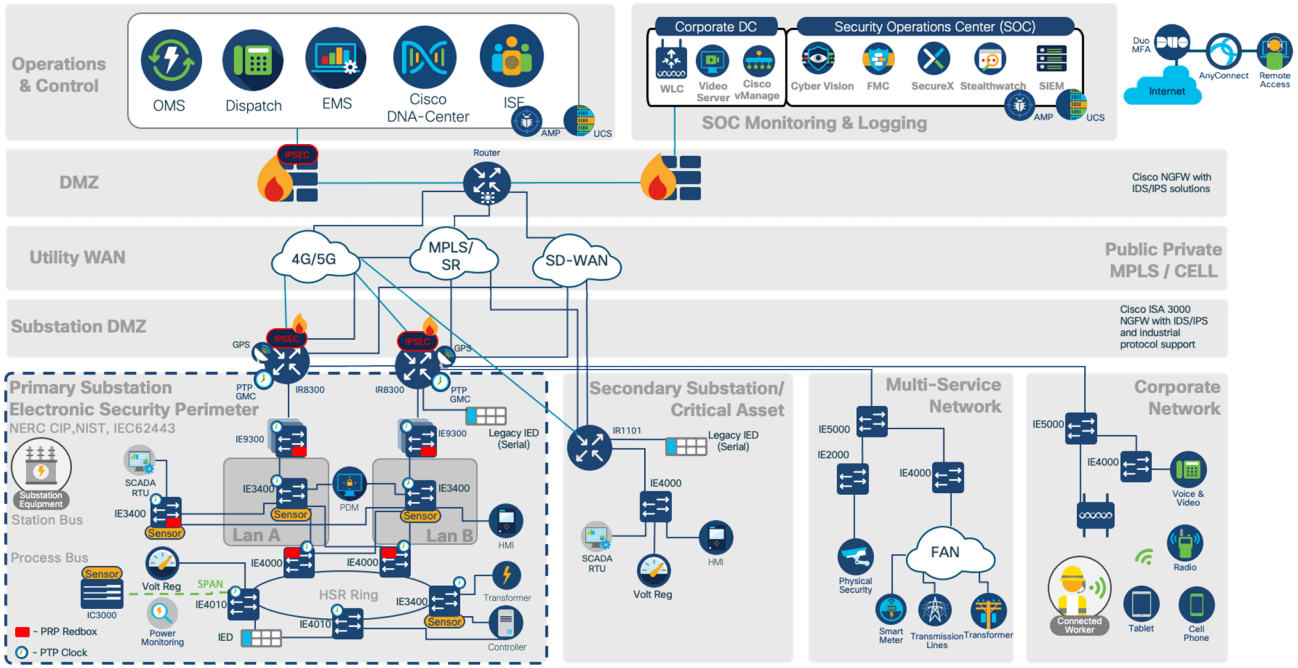


Cisco IoT

Cisco Validated Design: Substation Automation

Modernize Grid operations

Foundation for advanced protection and control, remote diagnostics and predictive maintenance capabilities.



Proven to work with: SEL Schweitzer Engineering Laboratories · SIEMENS · Schneider Electric · ABB

Outcomes

- Grid Modernization and sustainable energy
- Reduce operational cost and increase reliability
- Reduce risk from cybersecurity threats

Features/Functions

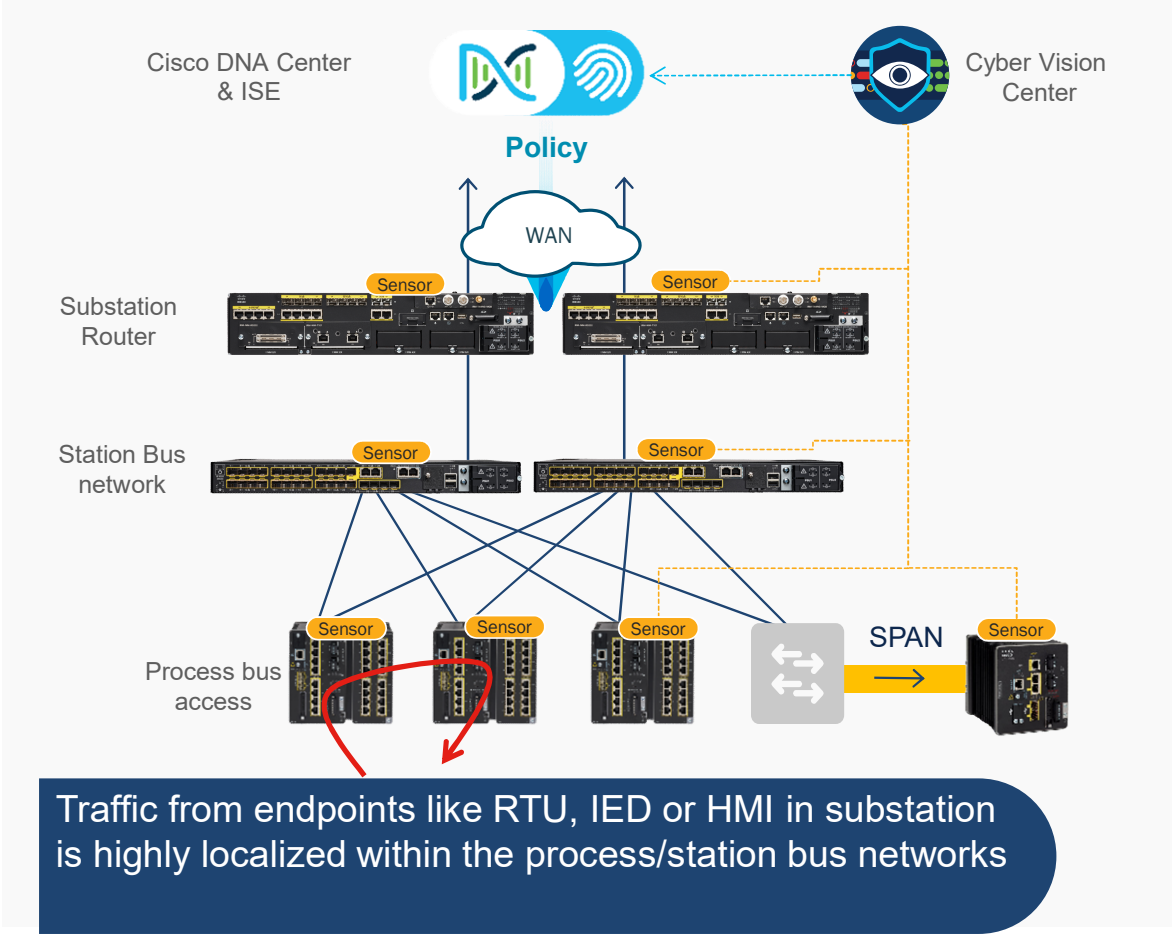
- Support SCADA - Serial/TDM to IP transition and Station & Process bus systems – (IEC 61850 compliance, DNP3)
- Support Tele-protection and power management (Synchorphasor/PMU, Volt/Var) applications
- Cybersecurity support for NERC CIP compliance
- Visibility of substation devices and communications
- Support lossless network resiliency and precise timing
- Proactively identify WAN/LAN network issues and receive remediation suggestions and consistently configure and maintain network infrastructure

Benefits

- Validated Design and Implementation guidance developed by Cisco engineering
- Tested against leading substation vendor devices and applications
- Experienced Cisco services ready to apply to customer scenarios

Cisco IoT

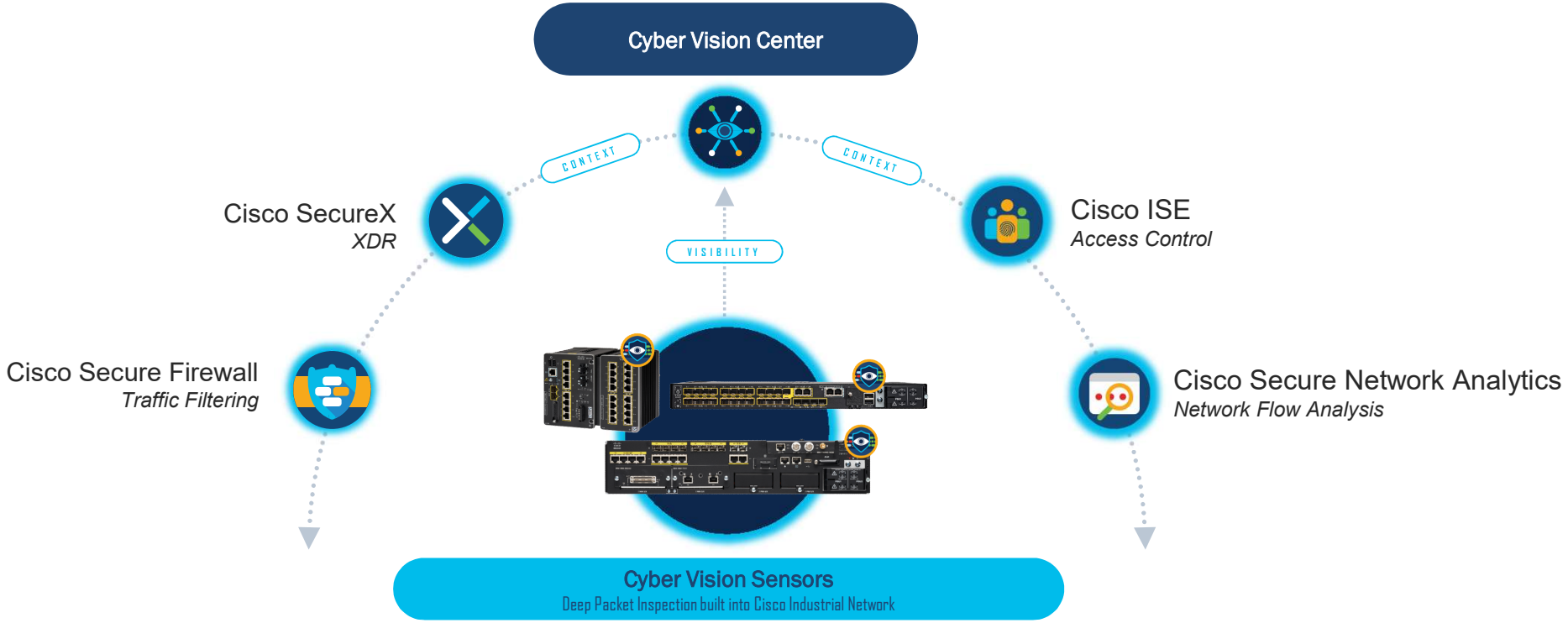
DNAC Enables Visualization of Security Policy



1. Discover endpoints and visualize application relationships in **Cyber Vision** to help create TrustSec group-based segmentation policies in **DNAC Access Control Application**
2. Endpoint grouping in Cyber Vision triggers pxGrid updates and results in dynamic assignment of SGTs in **ISE**
3. Visualize group-based network behavior using NetFlow traffic in **DNAC Policy Analytics**
4. Deploy segmentation policy with confidence using **DNAC Day-n templates** once you are comfortable with the observed network behavior

Industry-leading security built-in, not bolted-on

Operational security features with visibility across the enterprise



Unmatched enterprise-to-edge security • Powered by Talos Threat Intelligence

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Industry-leading security built-in, not bolted-on

Helping customers achieve NERC CIP Certification

NERC CIP Req.	Area	Technologies applied
CIP-002-5.1a	Critical Cyber Asset Identification	• Cisco Cyber Vision running on IE3400, IE9300 & IR8300 actively and passively identifying connected BES Assets
CIP-003-8	Security Management Controls Access Control	• Cisco's Identity Services Engine (ISE) provides Network Access Control (NAC) for BES Assets, • Cisco network infrastructure implements NAC via IEEE 802.1x • Cisco Duo for dual-factor authentication and • Anyconnect to encrypt remote access traffic
CIP-005-5	Electronic Security Perimeter(s)	• IR8300 Zone-based Firewall and/or • Cisco ISA 3000 Industrial Firewall
CIP-007-6	Systems Security Management	• Cisco's DNA-Center and vManage manage WAN and LAN infrastructure • Firepower Management Center manage firewalls
CIP-008-5	Incident Reporting and Response Plan	• Cyber Vision for anomaly detection for BES traffic • SecureX security orchestration for security events
CIP-010-2	Configuration Change Management and Vulnerability Assessments	• Cisco DNA-Center and vManage report on BES network infrastructure vulnerabilities and compliance • Cisco's Cyber Vision identifies BES asset vulnerabilities configuration changes
CIP-011-2	Information Protection	• Segmentation with Cisco next generation Firewalls, • Micro-segmentation with TrustSec in Cisco network infrastructure • Encrypted communications (e.g. VPN and MacSec), Anyconnect,
CIP-013-1	Supply Chain Management	• Cisco Trustworthy technology against counterfeiting and malicious code • IEC 62443 4-1 (Product development) and 4-2 (Secure Product) certifications

Only Cisco can support IT and Operations

Accelerate industrial digitization

Best of enterprise and industrial networks

Single architecture

IT teams - support operations without retraining

Ruggedized for any environment

Market leading industry expertise

#1 in market share across enterprise and industrial networking

Decades of experience

Resources to ensure success

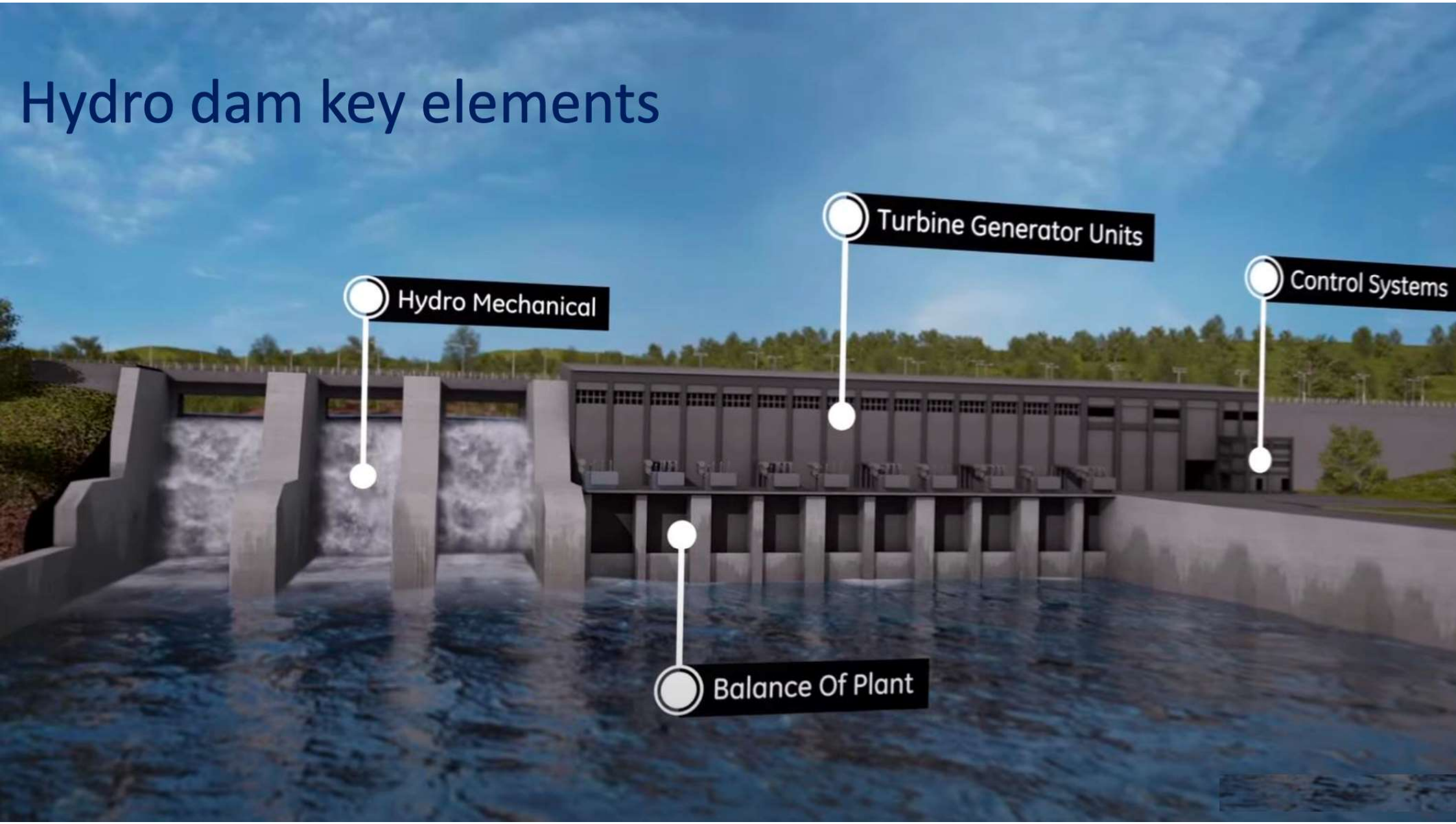
Cisco Validated Designs

Award-winning dev program

CX services

330 specialized partnerships globally

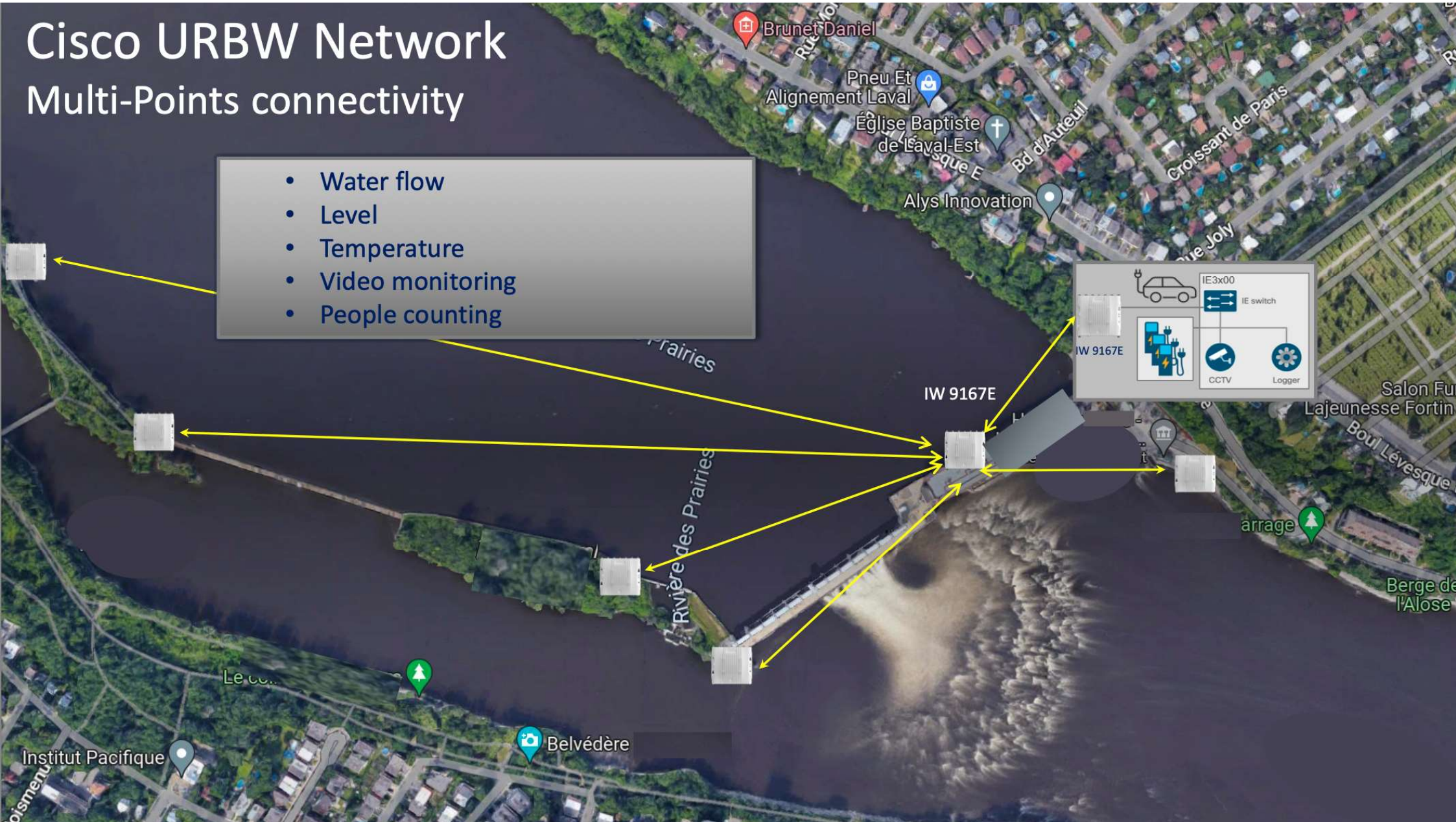
Hydro dam key elements



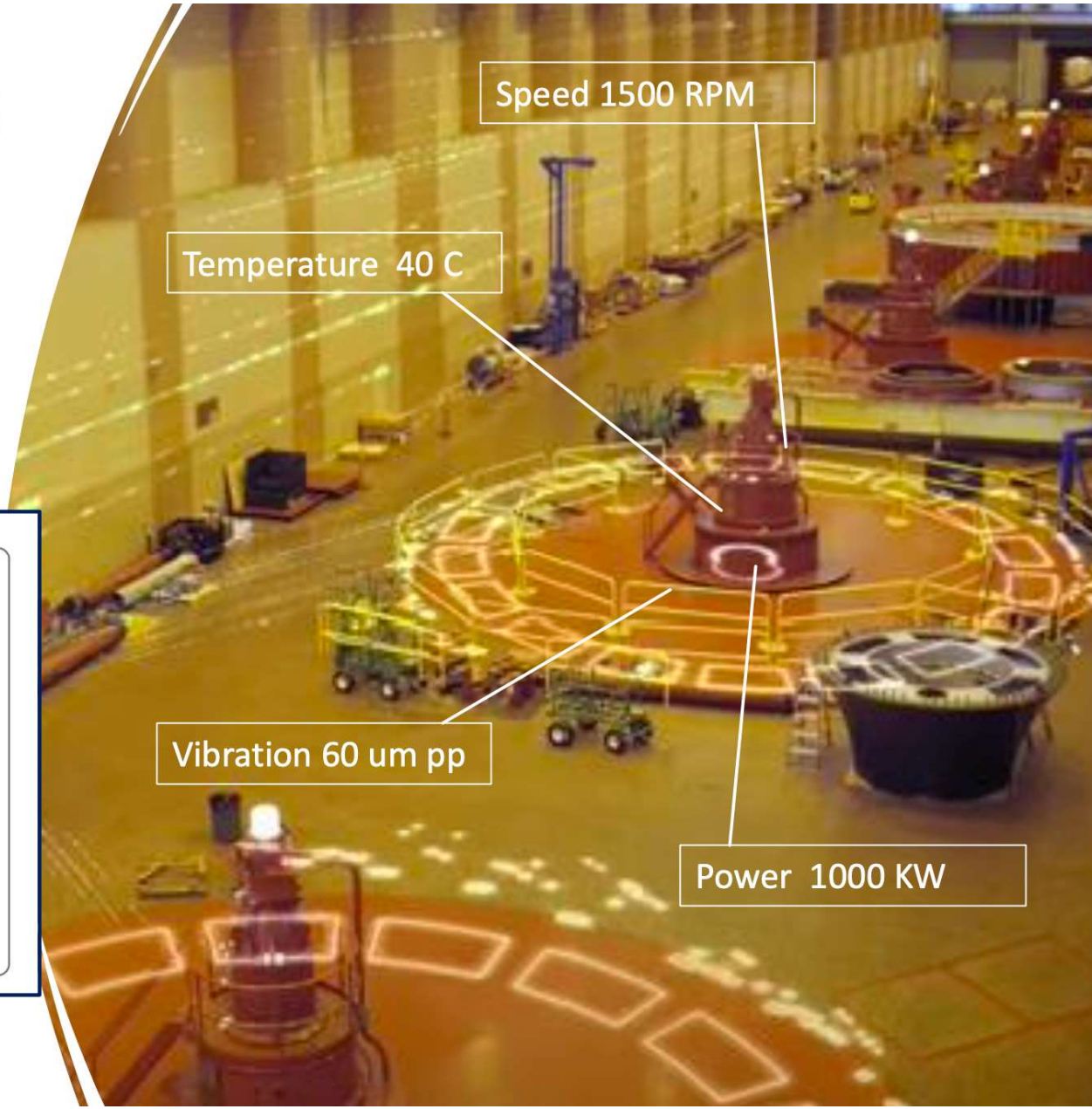
Cisco URBW Network

Multi-Points connectivity

- Water flow
- Level
- Temperature
- Video monitoring
- People counting



Turbine intermediary zones sensors

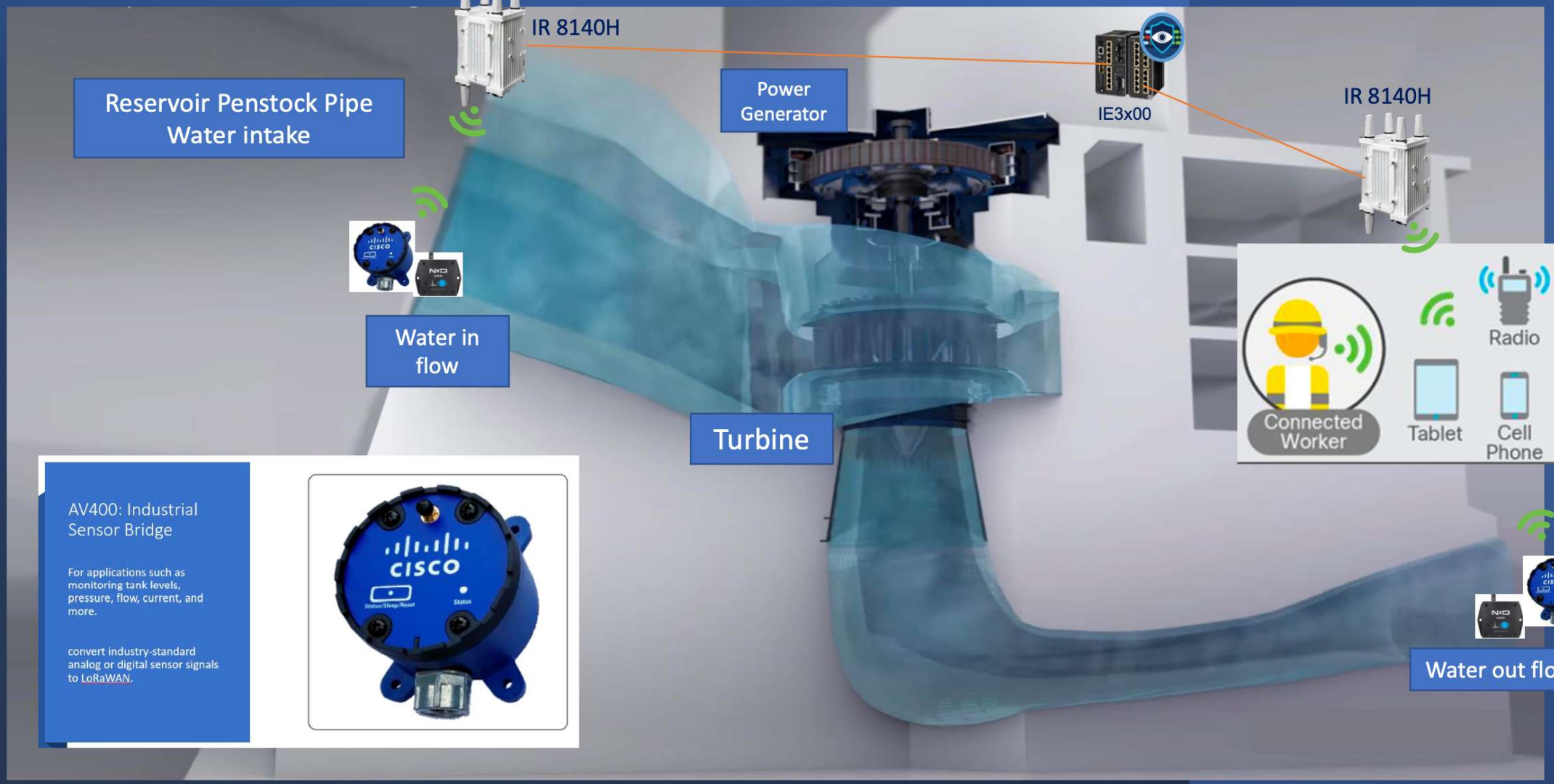


AV251: Vibration Monitoring Sensor

Sensor reporting:

Velocity RMS, Acceleration RMS, Peak, Displacement, Kurtosis, Crest factor, Skewness, and Standard Deviation values

Hazardous areas inspection

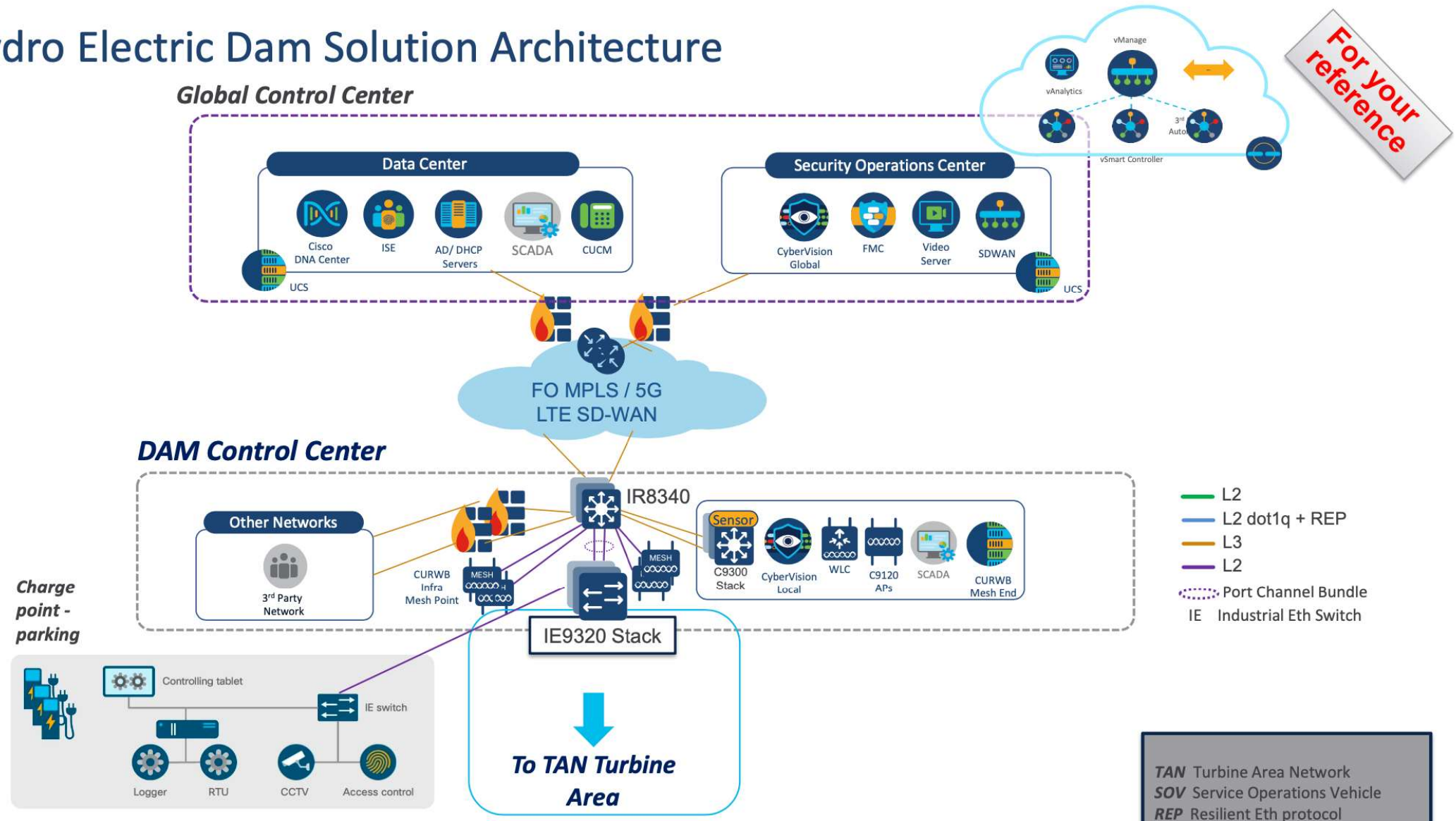


AV400: Industrial Sensor Bridge

For applications such as monitoring tank levels, pressure, flow, current, and more.

convert industry-standard analog or digital sensor signals to LoRaWAN.

Hydro Electric Dam Solution Architecture



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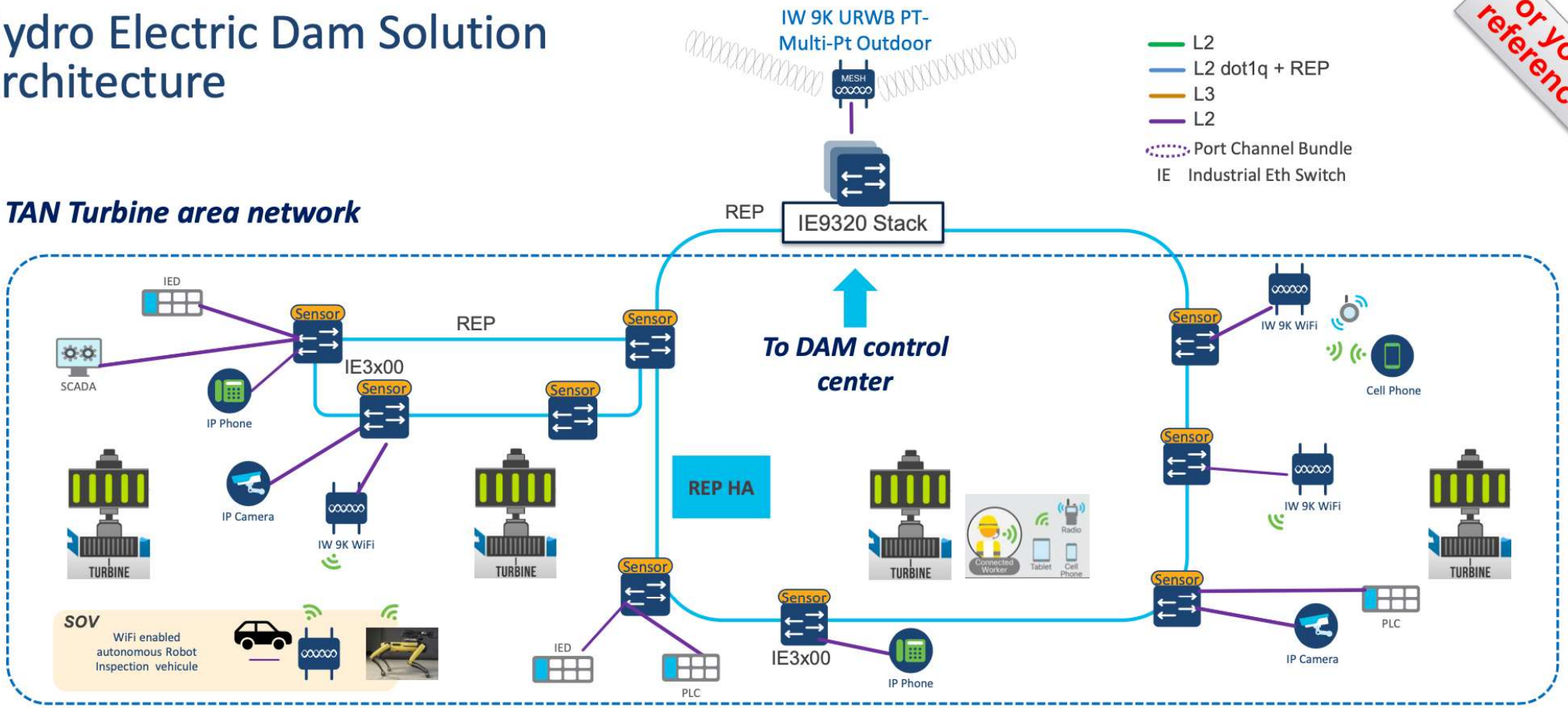


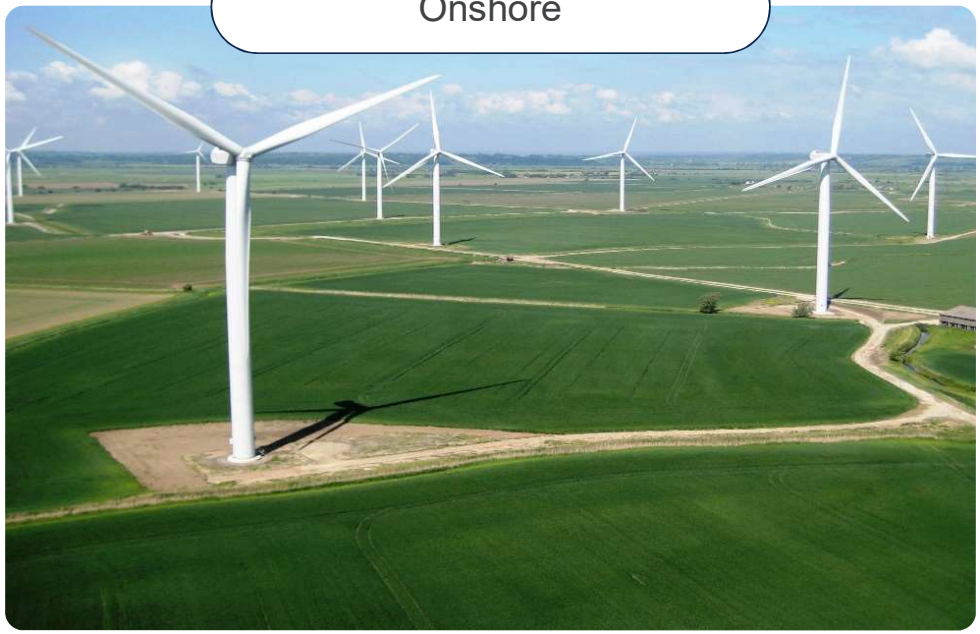
For your reference

TAN Turbine Area Network
SOV Service Operations Vehicle
REP Resilient Eth protocol
CV DPI sensor

Wind Energy – Market segments

Offshore

Onshore



Global demand accelerates Wind Energy revolution
Drive to zero emissions

- 64% of the Wind Power required must be reached by 2030 to stay on track for a net-zero / 1,5° C pathway.
- Total global Wind Power capacity is now up to 837 GW, helping the world avoid over 1.2 billion tones of CO2 annually – equivalent to the annual carbon emissions of South America.

- By 2027 Global Wind Market is projected to reach $127 Billion growing at a CAGR of 9.3% from 2020 to 2027.
- Europe will account for the largest growth market from 2020 to 2027.
- Offshore Wind is slated to grow the highest market growth in 2020-2027.

- Top countries that added new wind generation capacity are China, Brazil, Vietnam, UK, Sweden, Germany, India.
- New forecasted capacity is expected to reach 128.8 GW by 2026.

Wind Farm owners have many requirements from onshore to offshore

- Reliable connectivity for generating Green energy
- Ability to scale and manage power generation for hundreds of Wind Turbines
- Safety and cybersecurity to prevent attacks
- Easy Integration to the existing electrical infrastructure
- Reducing monitoring and maintenance costs
- Ability to deploy and manage remotely with limited IT skills

Solutions that are secure, reliable, and scalable
For state-of-the-art Wind Farm operations

Secure

Protect your network from cyberattacks with enterprise – grade security

Reliable and Resilient

Provide **reliable** and **resilient** connectivity for **extreme** environments

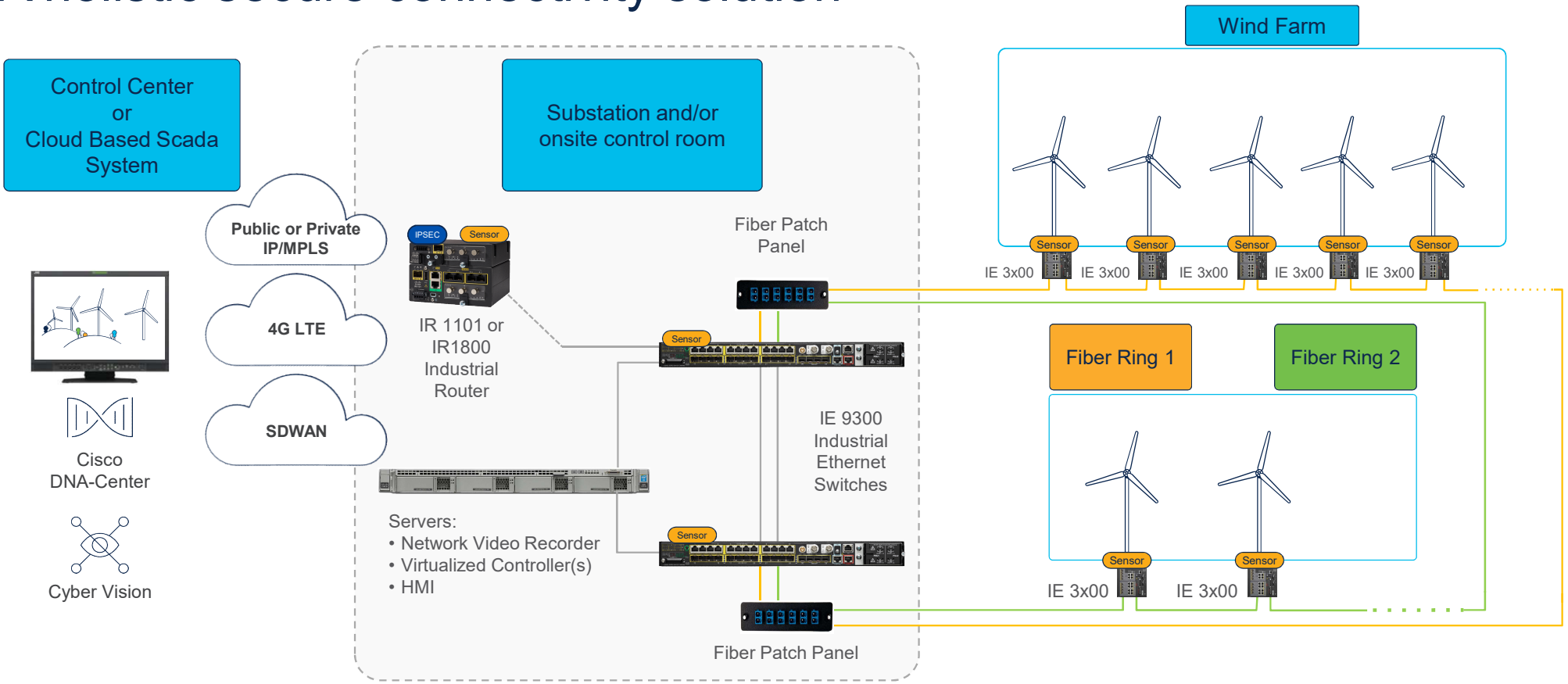
Scalable

Scale over **thousands of** turbines with **zero-touch** deployment

Better uptime, improved customer experience, and enhanced operational efficiency

Cisco end-to-end solutions provide better visibility and uptime for your onshore Farm infrastructure

A holistic secure connectivity solution



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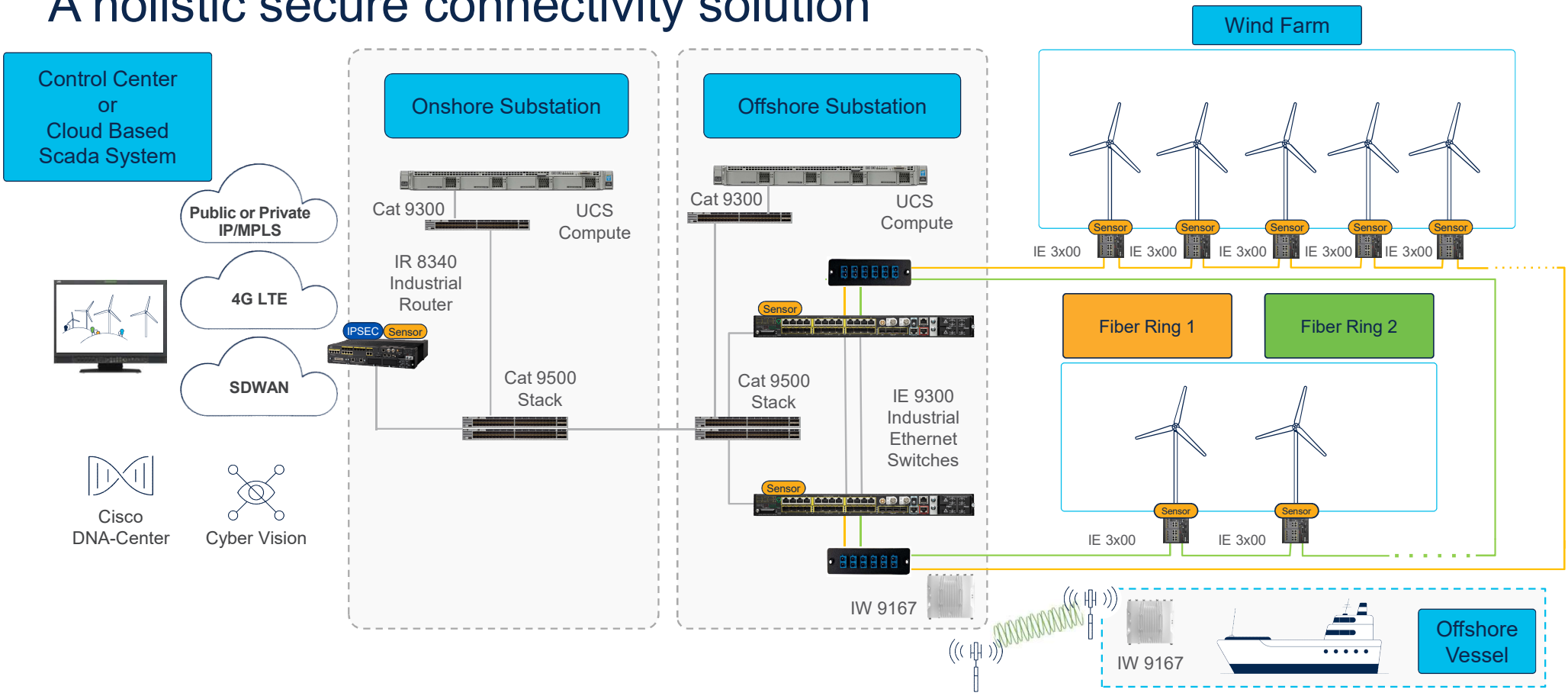


Secure, reliable, and scalable solutions for connecting your Wind Farm infrastructure

Secure

Device security

- IEC62443-4-2 Certified products.
- Signed firmware/Secure Boot, Cisco® Secure Development Lifecycle (IEC62443-4-1).

Network security

- Network encryption (VPN), traffic segmentation, hardware encryption, network telemetry.

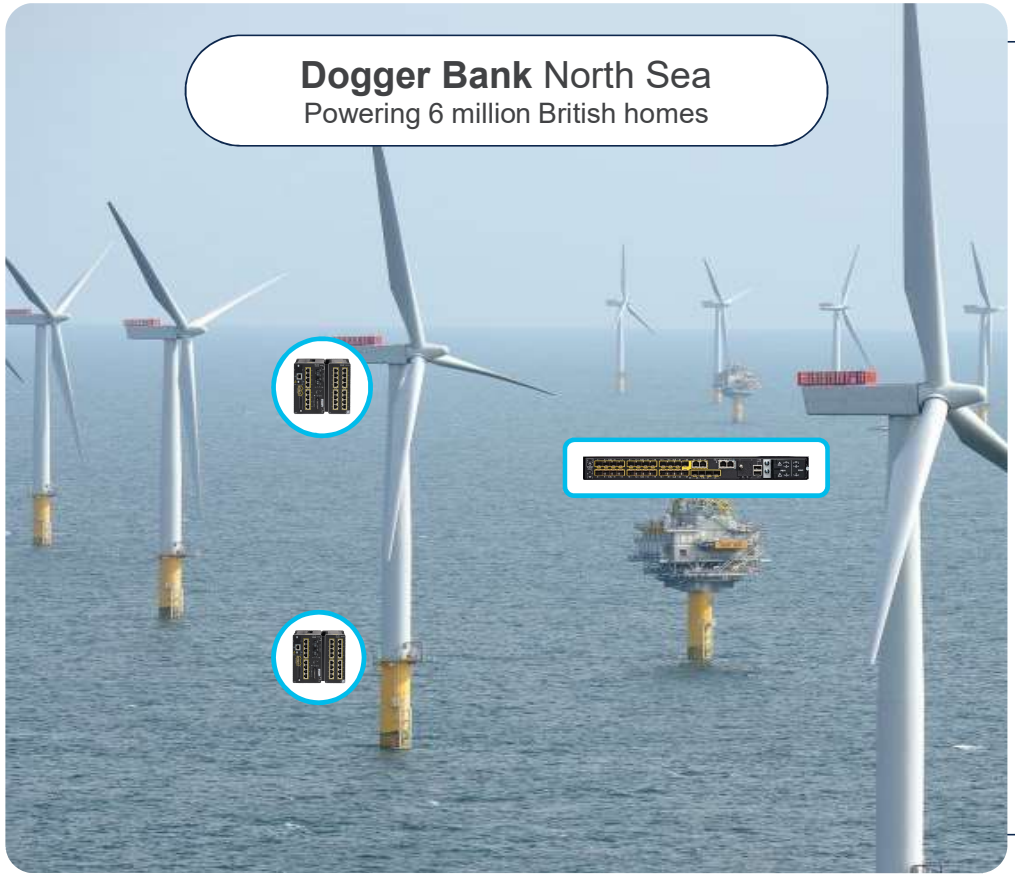
Reliable and Resilient

- **Ruggedized** portfolio that operates in **extreme** environmental conditions.
- Multiple backhaul technology options.
- **Redundancy** and **fast recovery times.**
- Field-proven products based on **Cisco IOS® XE** – deployed in millions of devices around the world.

Scalable

- **Automation with Zero-touch deployment** of network assets.
- **Cloud dashboard** for management of network assets and visibility of connected devices.
- **Secure Equipment Access** to troubleshoot equipment remotely.
- **Modular solutions** to enable large scale distributed deployments.
- **On-prem or cloud-based** architectures.

Secure connectivity for the world's largest offshore Wind Farm



Challenge

- Robust network infrastructure for 350 offshore Wind Turbines to withstand extreme conditions. Endpoints include cameras, sensors, locks, alarms.
- Collect up to 1400 data points using sensors that are not monitored by turbine OEMs to help isolate issues and drive predictive maintenance.

Solution

- Securely connect 350 Wind Turbines with Cisco industrial network consisting of IE3200 and IE3300 DIN rail switches deployed in the turbine base and nacelle. This plant IT network is as secondary network in parallel to turbine OEM control network.
- Fiber rings deployed in hierarchical topologies with REP redundancy to ensure sub-second convergence.
- Cisco industrial IE4010 rackmount switches deployed in floating substations for aggregating fiber rings.

Substation and Security Case Study

Challenge

- Reliable communications in remote, hard-to-reach locations.
- Minimizing costs troubleshooting and maintaining reliable ops.
- Redundant communications for improved operational availability.
- Protect people and property at remote sites.

Network Solutions

- **Multi-Service:** Cisco Connected Grid routers/switches for substation voice, video and data applications.
- **Reliability and Compliance:** Zone firewall, stateful NAT failover, HSRP for redundancy, segmentation, security and authentication.
- **Management and Diagnostics:** SYSLOG, NETFLOW, IP SLA, and SNMP for data trending analysis.

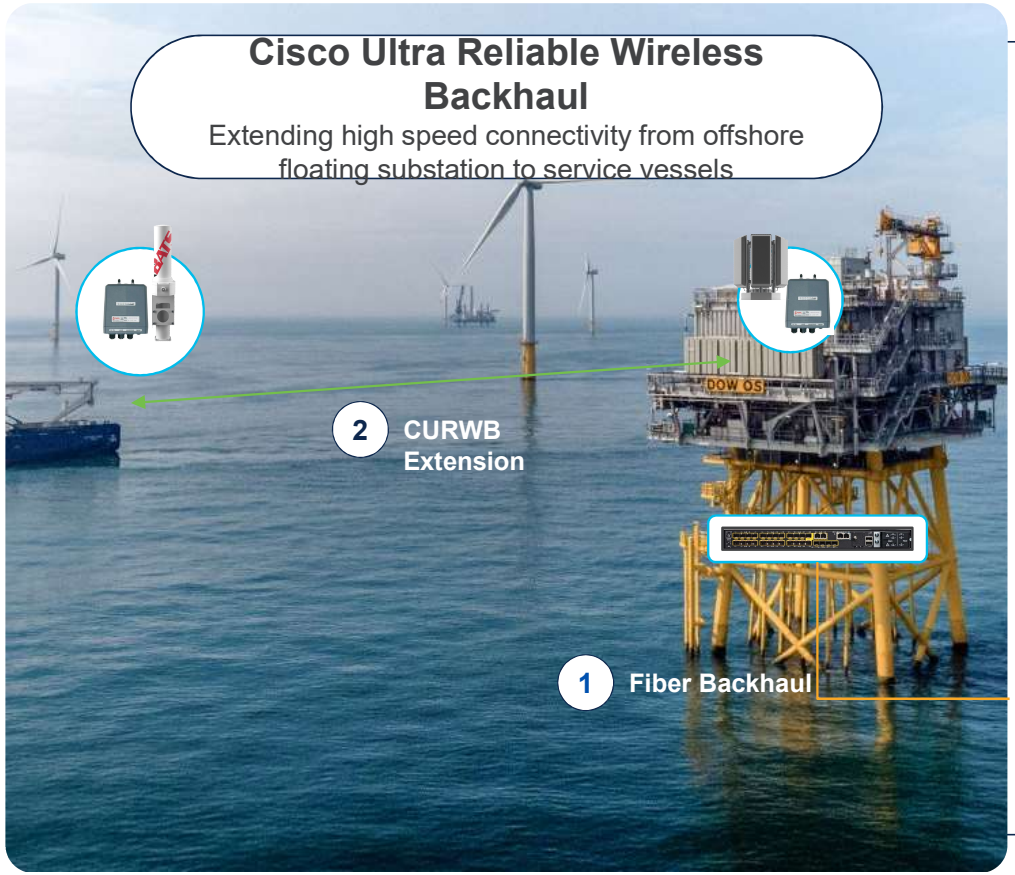
Results

- Reliable network yields lower SAIDI/SAIFI, reduced operating costs, and more efficient operations.
- Easy integration with existing network management tools.
- Cost avoidance by standardizing on single network platform.

> Using Cisco Connected Grid Routers and Switches saved network administrators from having to learn a new interface and tools for substation networks because we had already standardized on Cisco switches and routers in our offices.

Keske Toyofuku
Vice President and CIO for First Wind

Wireless backhaul for service operations and crew transfer vessels



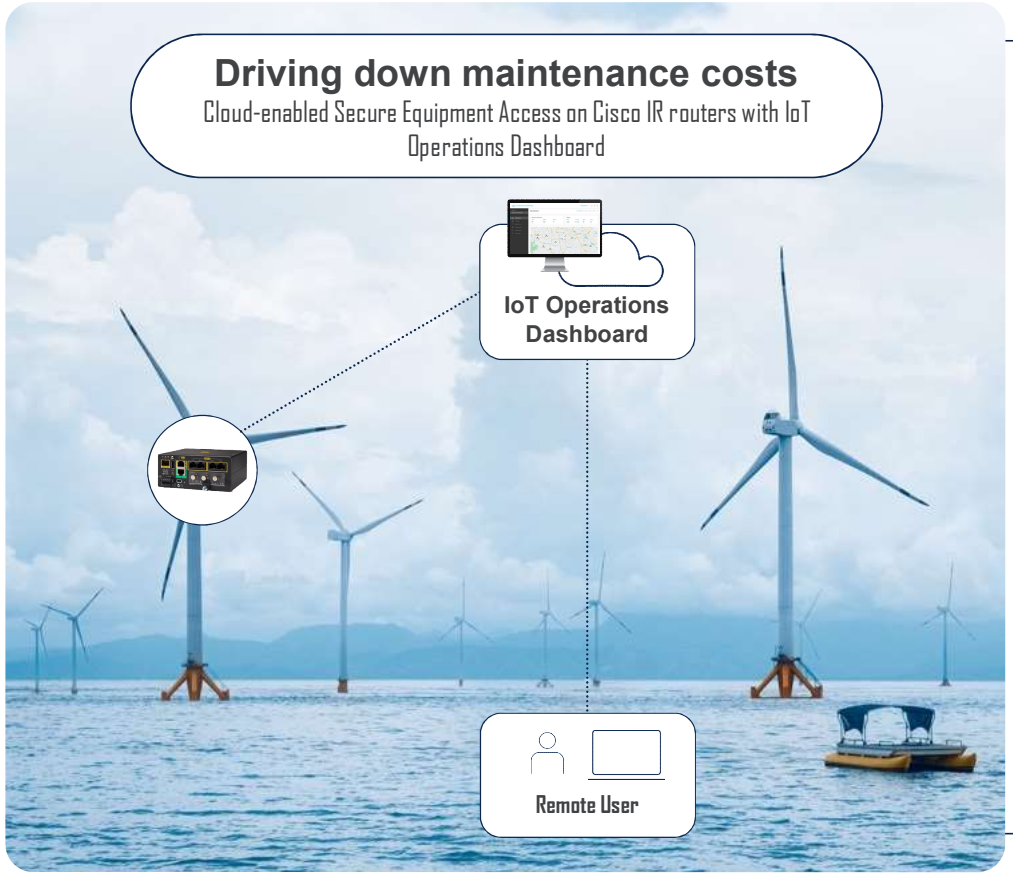
Challenge

- Expensive, low data rate, satellite connectivity insufficient to meet the needs of service operations and crew transfer vessels moving around the offshore windfarm estate.
- Remote expert personnel onboard vessels need high-definition video and reliable file transfer connectivity for service operations, and crews need high data rate connectivity for laptops, smart phones etc.

Solution

- Cisco Ultra Reliable Wireless Backhaul (CURWB) extends high-speed connectivity from substation platform fiber infrastructure to moving vessels.
- CURWB radios deployed with BATS antennas to automatically align, track, and optimize Point-to-Point (PTP) and Point-to-Multipoint (PTMP) wireless links.
- Delivering 229Mbps speeds at 1km to 50Mbps at 10km distance from floating substation.

Remote maintenance of offshore Wind Turbines in South Korea



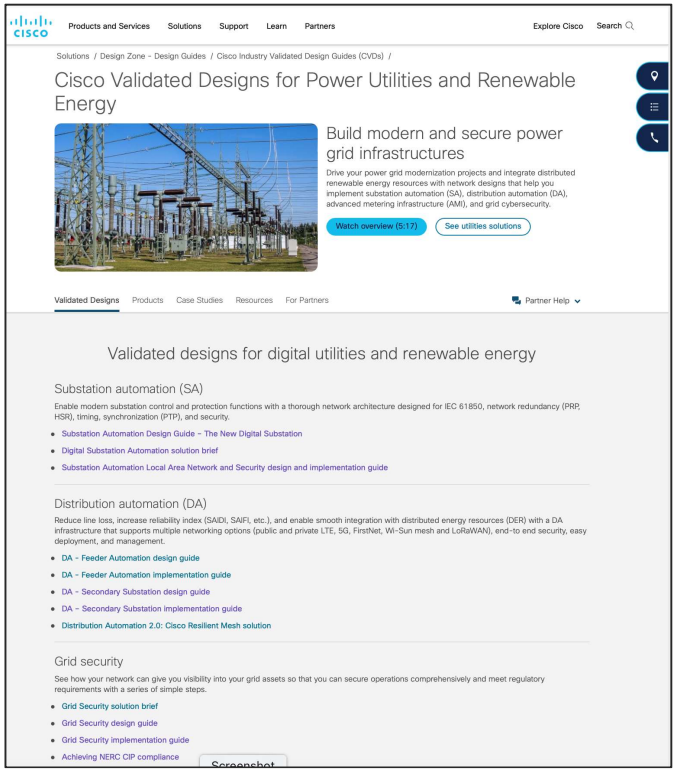
Business need

- Access to 160 offshore Wind Turbines as soon as each turbine is installed.
- Reduce cost by removing need for in-person visits via helicopter or sea vessel access to manage each Wind Farm.
- LTE connectivity to allow communication via service provider base station rather than expensive satellite communication.

Outcome

- Immediate remote visibility of Wind Turbines as soon as they are installed.
- Reduced cost through elimination of in-person site visits.
- Streamlined operations from remote access and management of Wind Turbines with Secure Equipment Access.
- Secure end-to-end connectivity.

Utilities IoT CVD Solutions on Cisco.com



What you will find here

- Solution Briefs
- Design Guides
- Implementation Guides

www.cisco.com/go/iotcvd

What's next

Explore Utilities resources

Discover Cisco Utilities solutions in the Portfolio Explorer

Why Cisco for Utilities

See our Cisco Validated Designs for Power Utilities and Renewable Energy

Hear from our Utilities customers

Stay up to date on the latest trends and announcements
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The bridge to possible