

# Applications and Use Cases of QKD Networks

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**ITUWebinars**  
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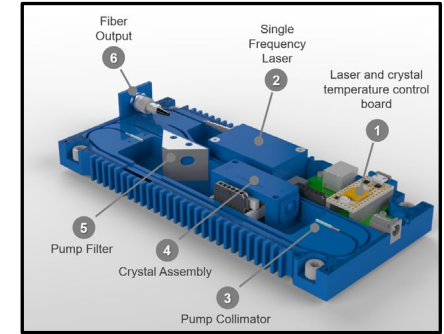
Securing the communications  
of critical infrastructure systems  
using quantum technology.

Qubitekk is a  
leading U.S.  
developer and  
manufacturer of  
quantum  
components and  
quantum  
communication  
systems.

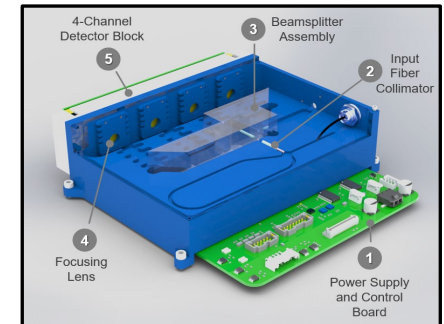
# OUR TECHNOLOGY

- Commercial devices and systems that we provide:
  - Quantum sources (810nm and 1570nm / Polarization entangled)
  - Quantum detection systems (multi-basis analyzers)
  - Integrated channel stabilizers
  - Synchronization electronics
  - Quantum key distribution modules and dev kits
  - Packaged InGaAs detectors

*Quantum Sources*



*Qubit Detectors*



*Quantum security modules*

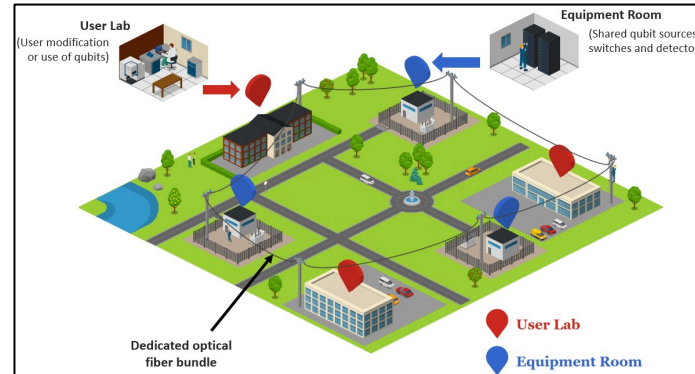


# QUANTUM APPLICATIONS

Commercial entangled  
photon sources and  
detectors



Applications

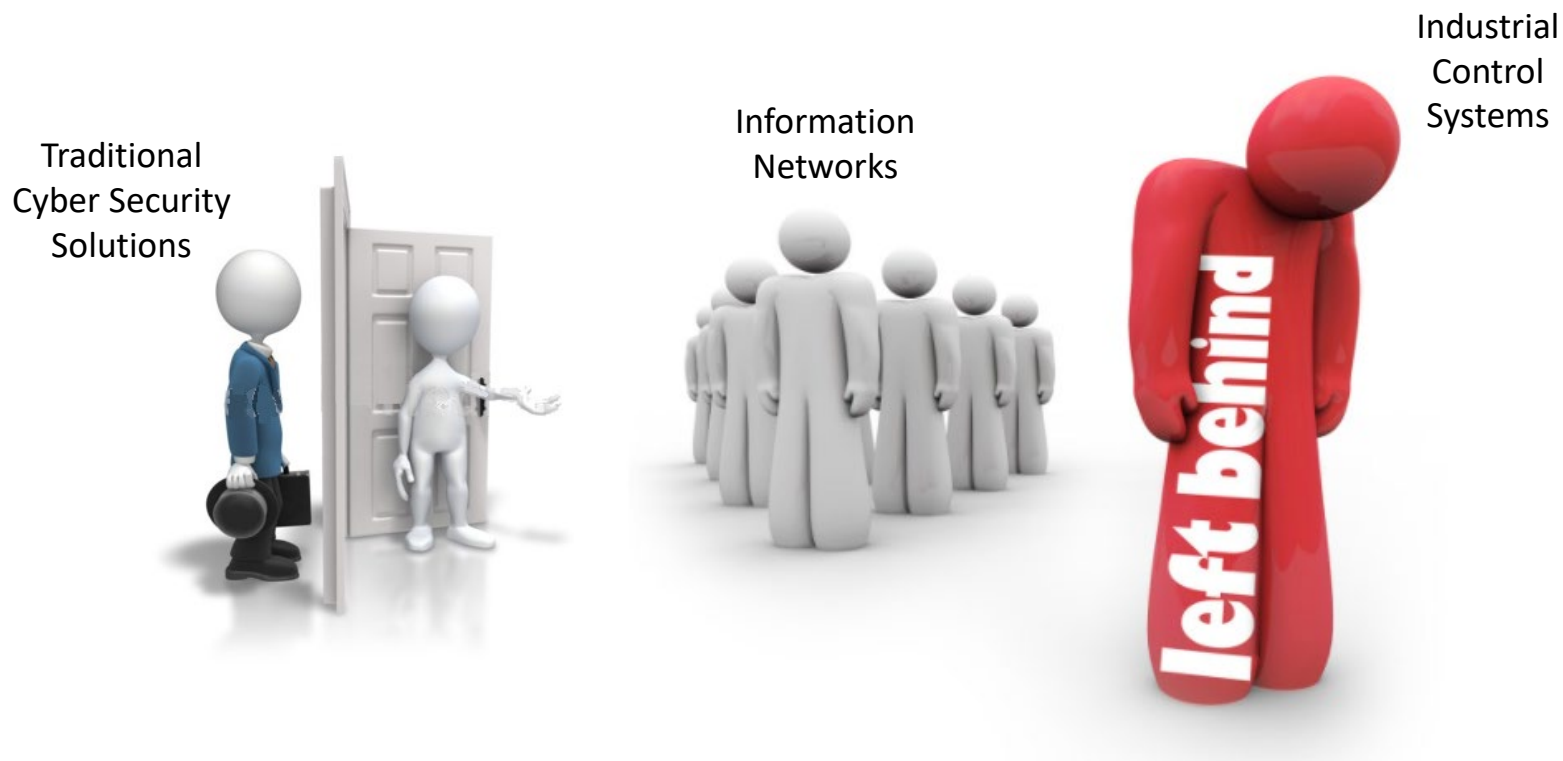


- Entanglement-based QKD
- Small quantum networks
- Quantum repeater research
- Quantum-enhanced Time Sensitive Networking



# QKD Use Case: Industrial Control Systems

*All networks are not the same. Some network types currently do not have a feasible security solution and are underserved.*



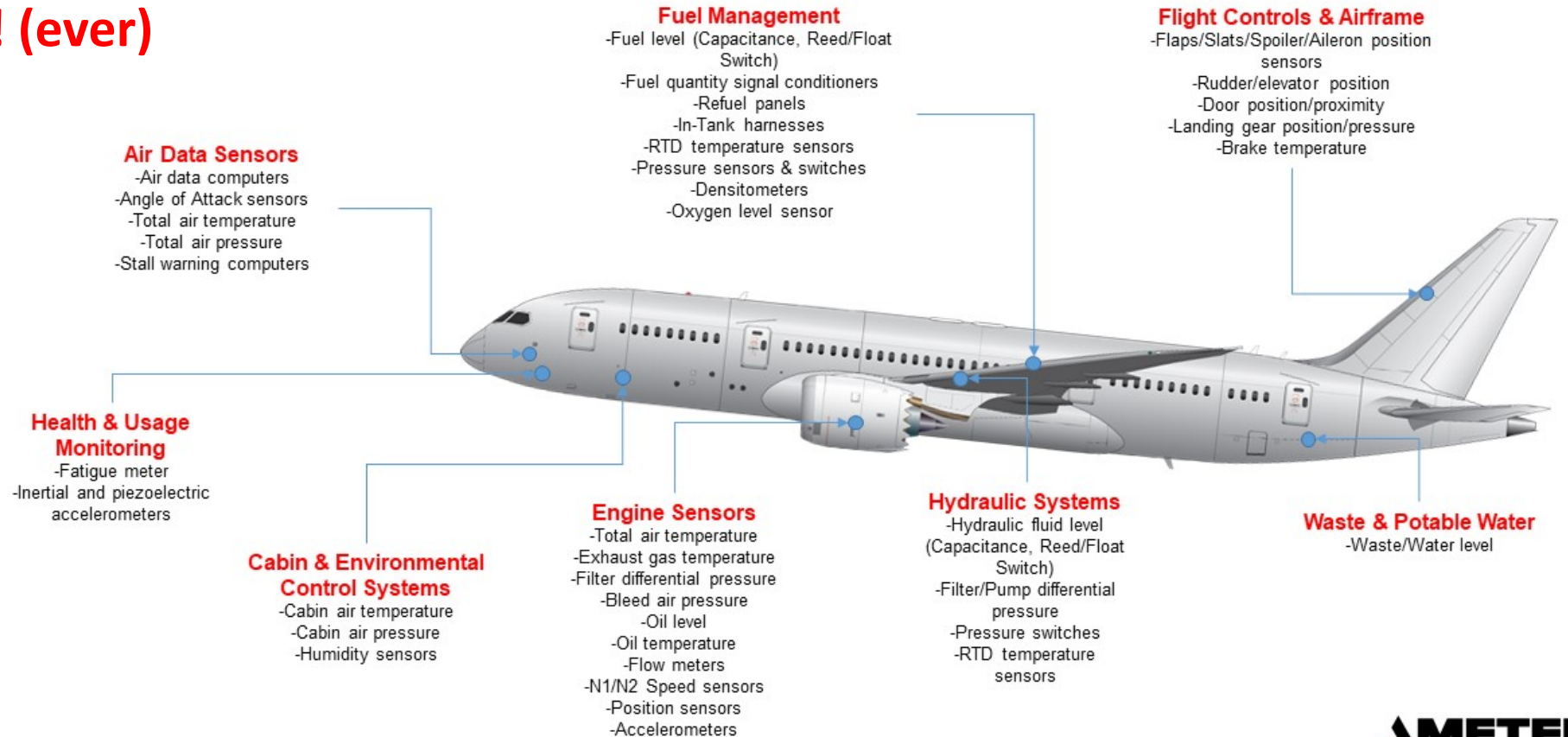


## Network Requirement #1

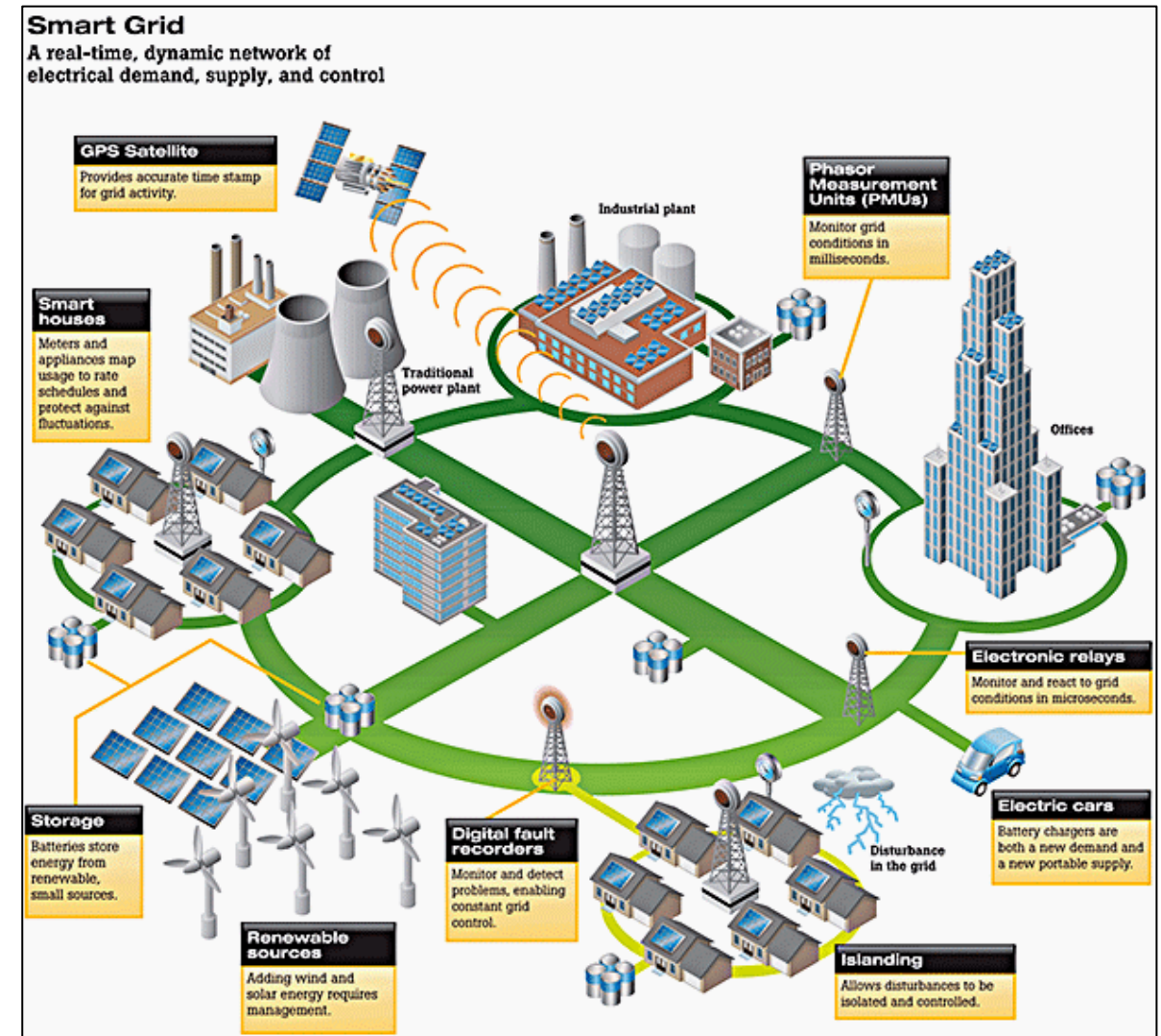
**Aircraft cannot crash! (ever)**

## Network Requirement #2

**Security... but solution cannot impact network requirement #1**

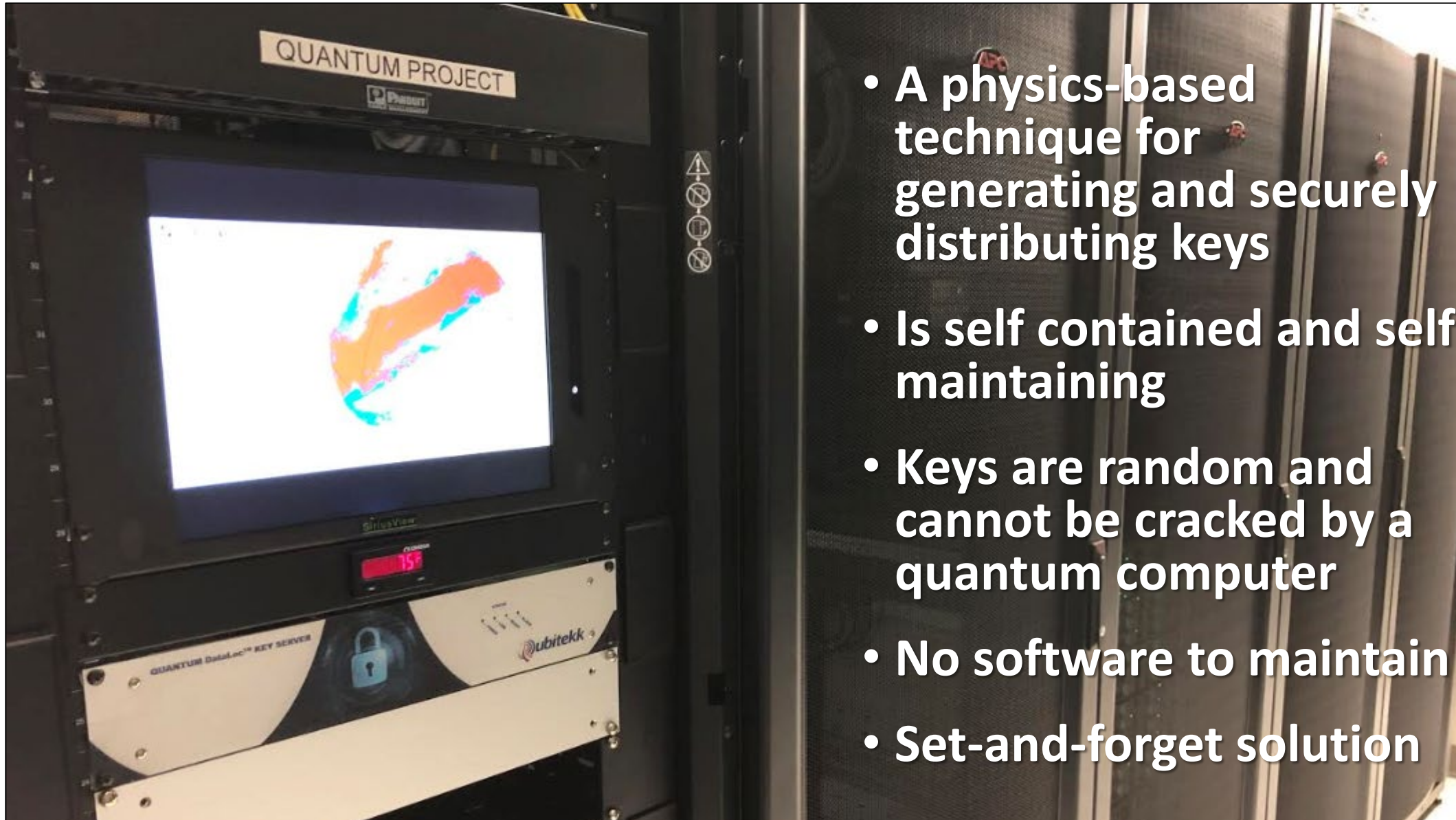


- Network requirement #1: **The grid cannot go down! (ever)**
- Critical communications occur between distributed substations and a control center
- Fiber optics communication channels are often already present
- Communication channels are unprotected
- Distances between substations is <20km
- Data bandwidth requirements are very low
- Key rate requirements are very low (a few keys per day)
- Cybersecurity solutions must be secure, reliable, and easy to maintain (*i.e. cannot impact network requirement #1*)



*Courtesy: The What and Why of Smart Grids (ennomotive.com)*

# What is Quantum Key Distribution?



- A physics-based technique for generating and securely distributing keys
- Is self contained and self maintaining
- Keys are random and cannot be cracked by a quantum computer
- No software to maintain
- Set-and-forget solution

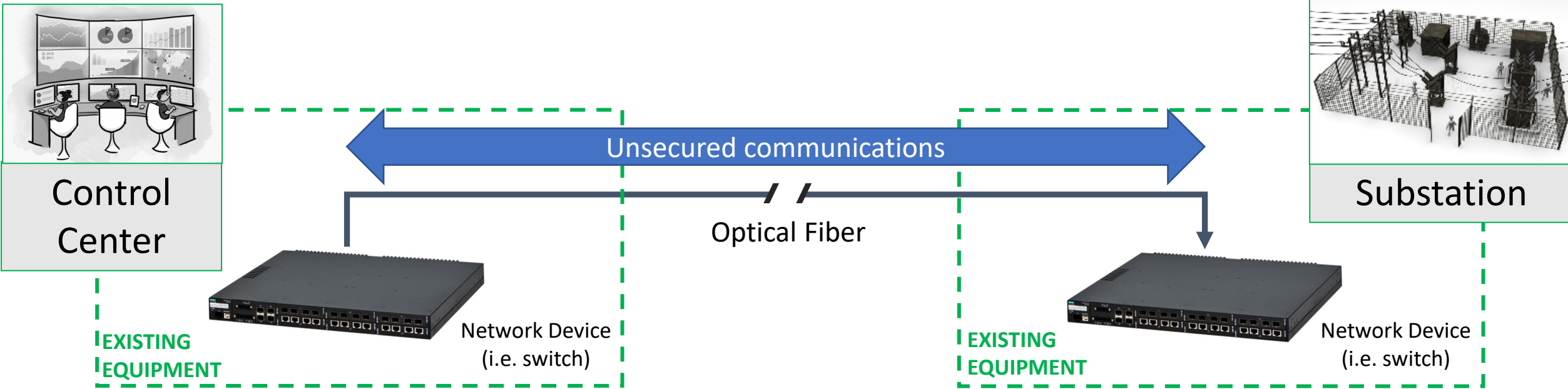


# Benefit of QKD to utility ICS networks?

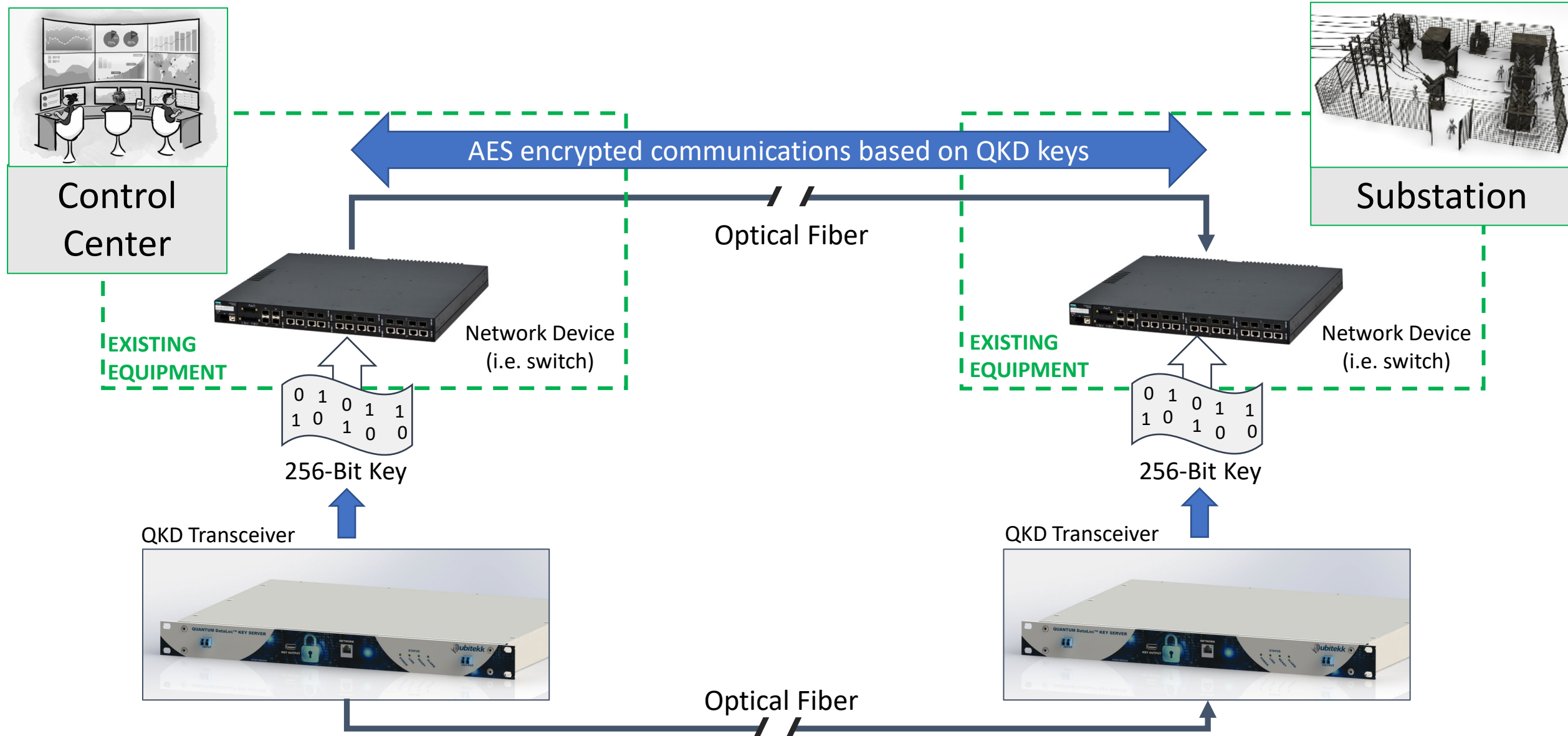
1. Does not add complexity that compromises the reliability of the electrical grid
2. Does not add complexity that compromises the reliability of the electrical grid
3. Does not add complexity that compromises the reliability of the electrical grid

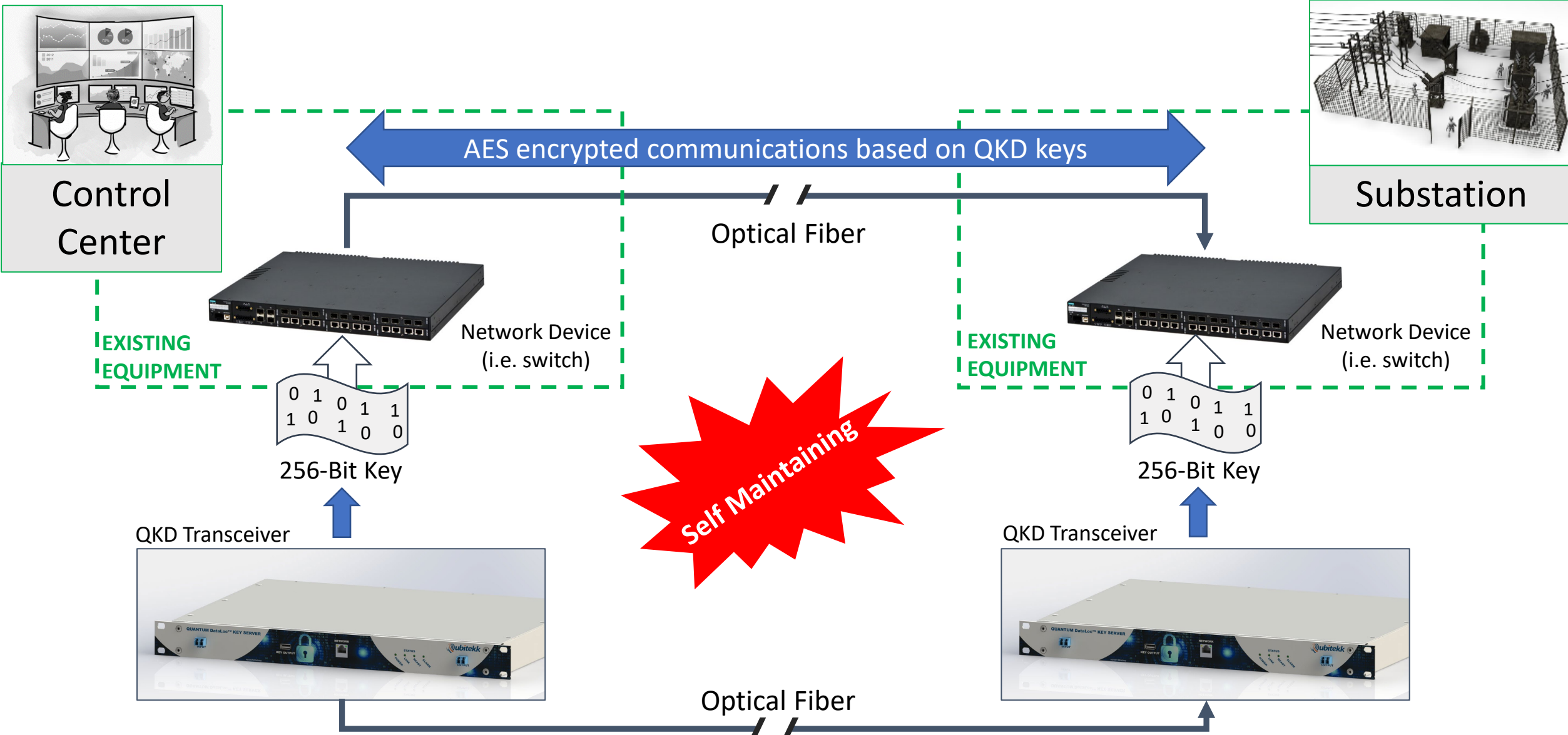


# Implementation Example



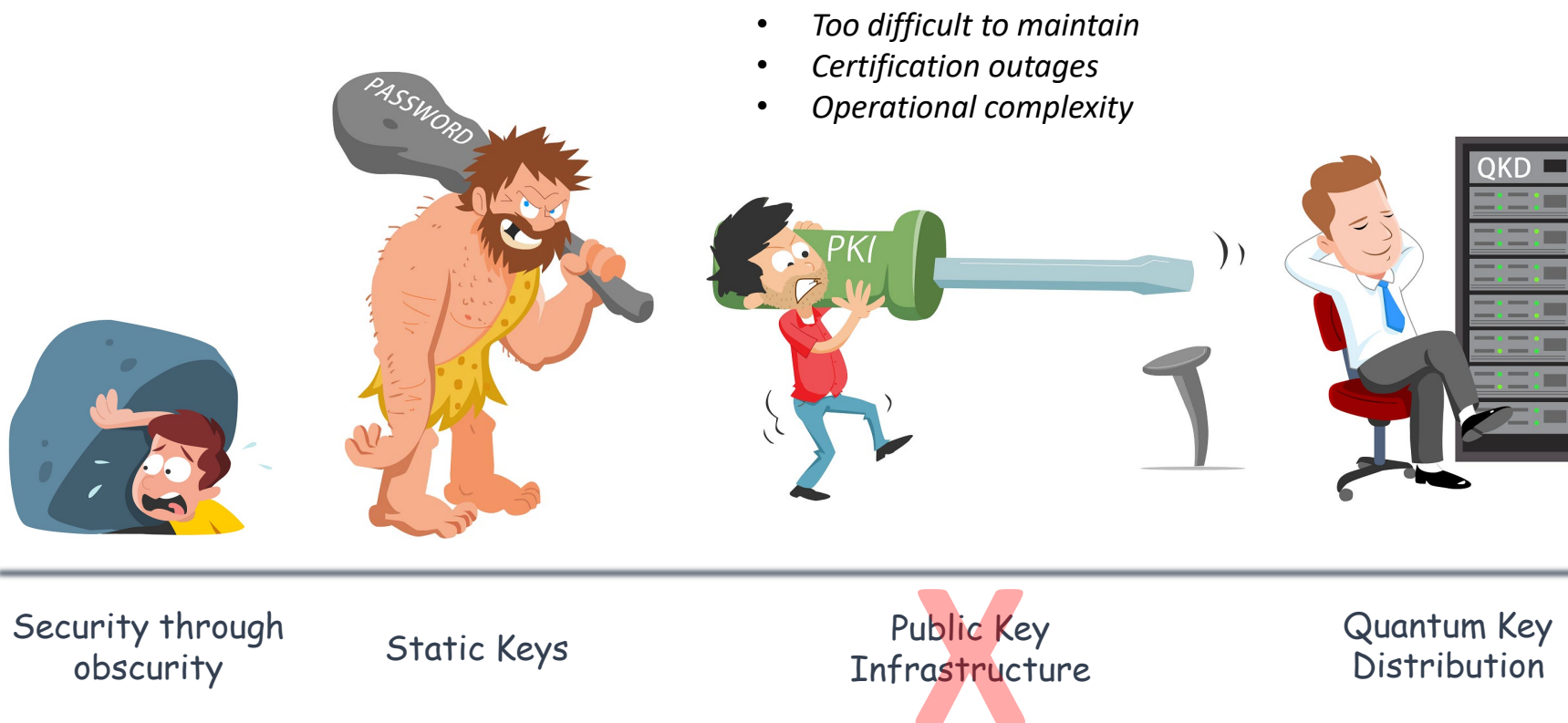
# Implementation Example







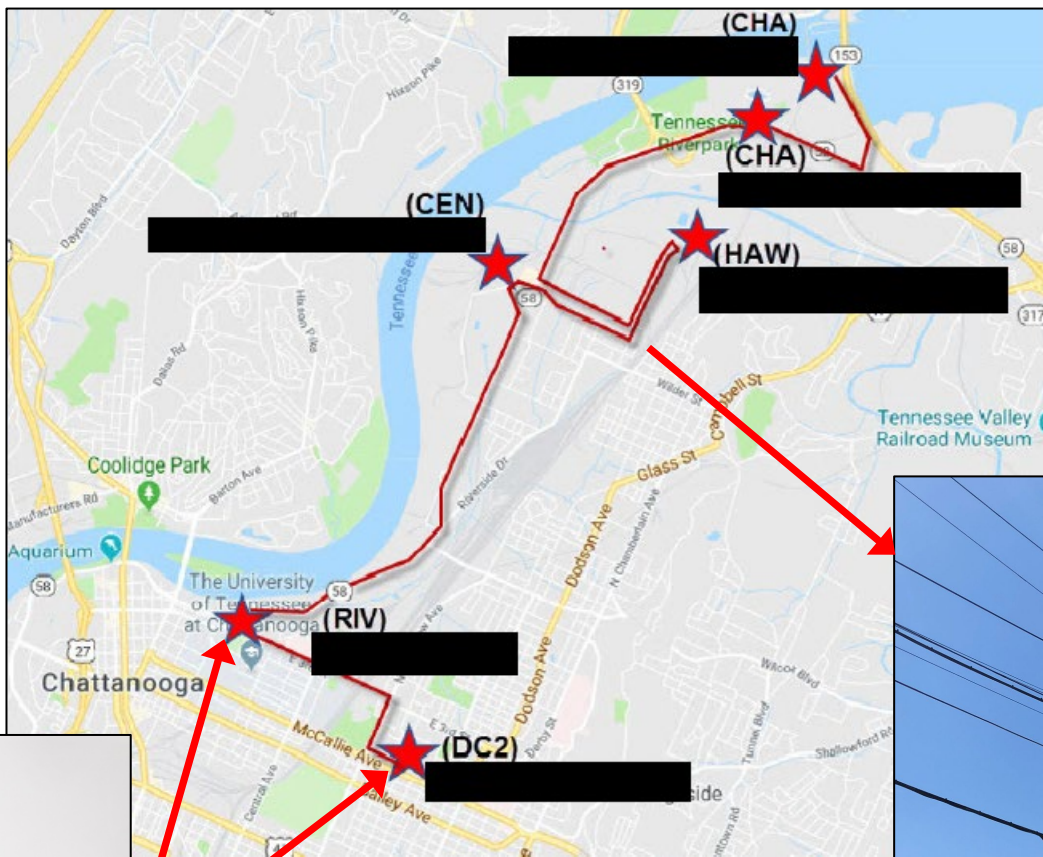
## Evolution of Utility Control Network Security





# Utility Demonstration in US

27 km distribution line (5 substations + 1 control center)



*Qubitekk QKD Transceivers*



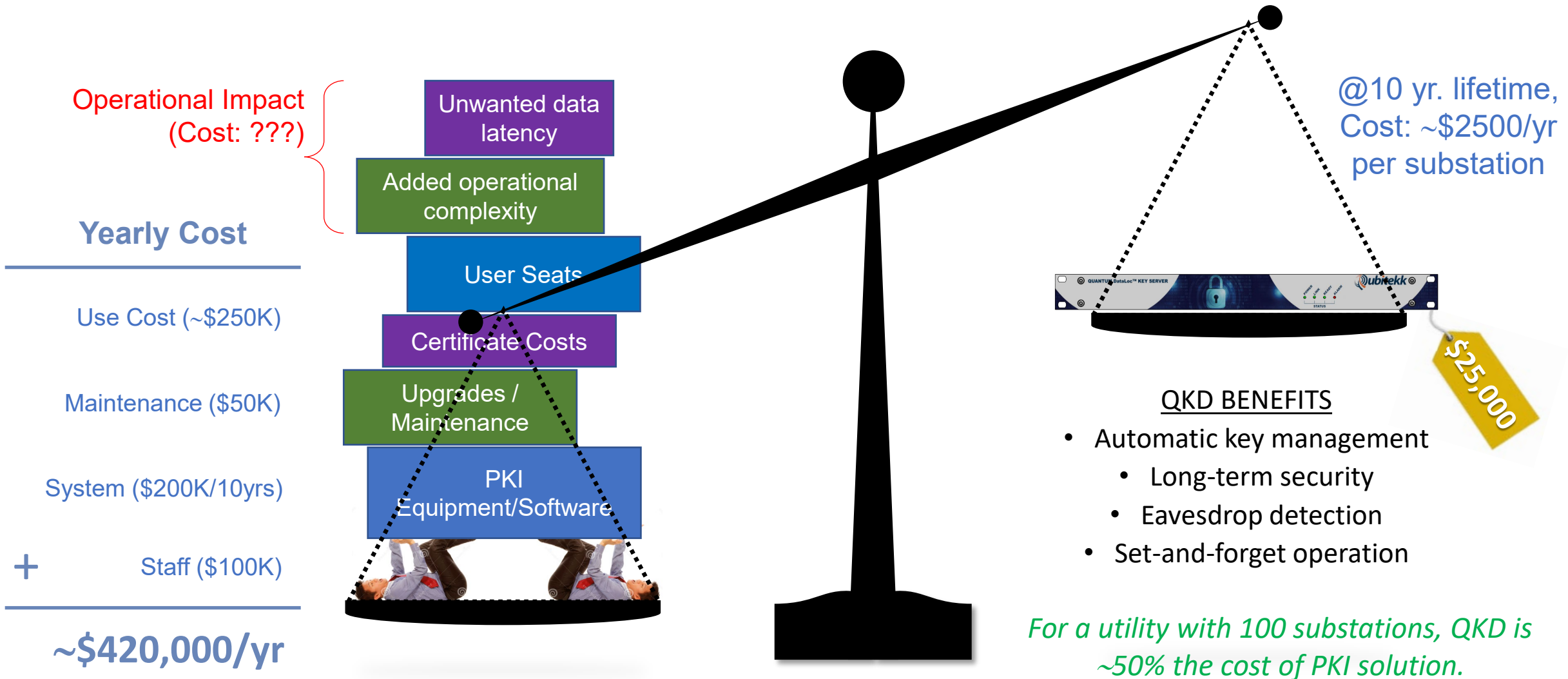
Aerial Optical Fibers



# Adoption: Cost Benefit Analysis

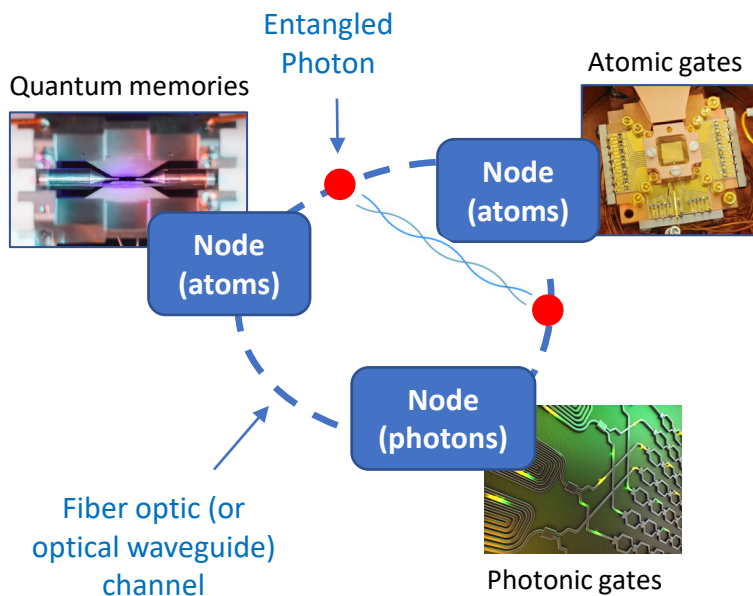
## PKI Solution

## QKD Solution



# QKD networks based on entanglement can enable more versatile quantum networks

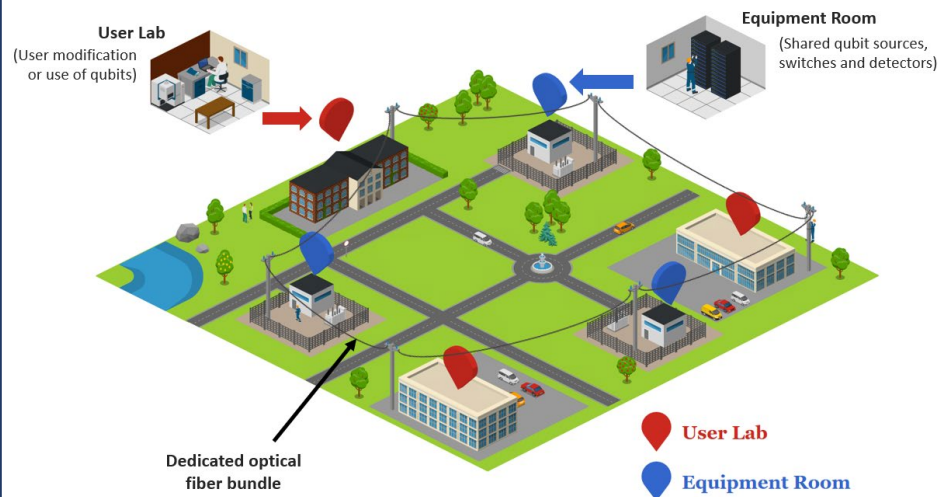
## Centimeters-to-Meters



Quantum Computing  
& Sensing

## Meters-to-Kilometers

### A QUANTUM CAMPUS



Quantum Networking

## Many Kilometers



Quantum satellite's  
free-space link

Terrestrial fiber optic  
quantum network

Quantum Secure  
Communications



- ICS networks are an excellent first use-case for QKD
- For electrical utilities: QKD solves a problem that classical solutions cannot
- Can make a viable economic argument for utility adoption
- Adoption will occur as technology matures and solution is refined for customer
- Can be a “stepping-stone” solution to more general quantum networks for qubit distribution



**Thank You!**



# Contact Information...

For additional Information, please contact:

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