Digitalizing Europe's energy system to power the green energy revolution

Cisco and the Digitalization of the Energy System

About Cisco

Cisco is helping capitalise on the opportunities of tomorrow by proving that amazing things can happen when you securely connect everything and everyone. An integral part of our DNA is creating long-lasting customer partnerships, working together to identify our customers' needs and provide solutions, at scale, that fuel their success.

Since our founding in 1984, we have maintained this focus on solving business challenges. Len Bosack and wife Sandy Lerner, both working for Stanford University, wanted to email each other from their respective offices, but technological shortcomings did not allow such communication. A technology had to be invented to deal with disparate local area protocols, and as a result of solving their challenge, the multiprotocol router was born.

Digitalizing the Energy System

Since then, we have grown as a company with a hardware, software, and service portfolio used to create the Internet solutions that make networks possible - providing easy and secure access to information anywhere, at any time. As a company, our entire focus is helping our customers (including many energy providers) to connect, secure and automate, in what is quickly becoming a cloud-first world. For customers, one of the most pressing issues is meeting new sustainability obligations and commitments, such as reducing energy consumption and increasing efficiency. And that's exactly what digital technologies and connectivity can help do.

Thanks to our innovative digital technologies and connectivity solutions, Cisco is working alongside many energy companies and utility providers to help them capitalize on the digitalization potential of the energy transition.

EU Action Plan to Digitalize the Energy System

- The European Commission published the EU Action Plan to Digitalise the Energy System in October 2022.

- New technologies are key to improving the efficiency of resource usage, integrating renewables into the grid, and saving costs for consumers and companies alike.

- The Action Plan calls for EU Member States to enhance the cyber defence of critical entities such as data centres, water utilities and energy infrastructure.

- Cisco is well-positioned to offer solutions in many of the priority areas highlighted by the European Commission in the Action Plan:

  - **Investing in digital energy infrastructure**
  - **Cyber security in the energy sector**
  - **A skilled workforce to accelerate the transition**
  - **Digital innovation in energy**
  - **Controlling the energy use of the ICT sector**

- Below we will examine each of the above topics, highlighting their relevance to energy digitalization and the products and services that Cisco has developed to enhance this digitalization.

An EU Action Plan to digitalise the energy system

OCTOBER 2022

To end the EU's dependence on Russian fossil fuels and tackle the climate and energy crisis, the EU's energy system requires a deep transformation, in which digitalisation plays a central role. The EU needs a more active and smarter energy system to help consumers embrace the benefits of the green and digital transitions.

Therefore, **the Commission is proposing an Action Plan** to:

- Promote **connectivity, interoperability** and **seamless exchange of energy data**
- Boost and coordinate **investments in the smart electricity grid**
- Provide **better services based on digital innovations** to engage consumers in the energy transition
- Ensure a **cyber-secure energy system**
- Ensure that the growing energy needs of the ICT sector **align with the European Green Deal**

Through digitalisation, we can improve the **affordability, sustainability** and **resilience** of our energy system.

Affordability

- Energy savings **enabled by smart solutions** help reduce costs
- Innovative energy services **reduce energy consumption** and using energy when is cheap (smart EV charging, smart heat pumps combined with PV panels)
- Digital tools allow consumers to **easily assess the benefits** and **invest more in renewables**

Sustainability

- A digital energy system is **more flexible** and **requires less curtailment of renewable electricity**
- A greener ICT sector with innovative systems **ensures an effective use of data**, and **can help boost renewables and reduce wasted energy**

Resilience

- Well coordinated cyber security actions **strengthen the overall system resilience**
- A digital energy system can better **anticipate peaks and lows in renewable energy production**
- Data exchanges make the **energy system smarter** but should only happen when consumers agree

Why Utilities are Digitalizing

The energy sector is facing greater challenges than ever before:

- Grids must handle more sustainable, distributed, and variable energy sources

- Environmental impacts such as fires and extreme weather conditions

- Evolving business models

- Expansion of grid capacity as the economy electrifies

- Cybersecurity risks

- Skills and resource gaps

Digital solutions present significant opportunities for utilities:

- By 2030, digital technologies could help resource-intensive industries reduce their global CO_2 emissions by 20%, i.e. these technologies can save 9.7x more emissions than they produce.

- The IEA predicts that by 2030 the global clean tech market will surpass the value of the oil market – rising from €122 billion in 2022 to €870 billion by the end of the decade.

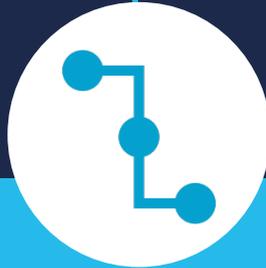# Enabling the Energy Transformation

Customer Examples

Architecture | OT | Security

- Securing networks of wind turbines and electrical systems

- Reducing cyber attack risks

- Enabling the potential of digitization

IT | OT

- Supporting expansion

- Segregation of IT & OT infrastructure to secure and streamline operations

- Roadmap to migrate IT workloads to cloud

Smart Grids

- Shifting to Smart Grid

- Developing a Multi–Utility OT Network Reference Architecture

- Futureproof distribution network

Investing in Digital Energy Infrastructure

Power grids are one of the most critical infrastructures for all energy systems, thus it is critical that they are modernized and well maintained. Investing in grid digitization is crucial for:

- Modernizing and improving efficiency
- Increasing resiliency
- Improving energy storage capacity (particularly for renewables)
- Integrating renewables into the grid
- Increasing customer autonomy over production and use

Smart Grids offer an intelligent future electricity system connecting all supply, grid, and demand elements via an intelligent communication system. They have many benefits:

- Better oversight of supply and demand
- Advanced analytics to optimize energy usage
- Reduce costs

Essential Services for Modern Digital Electricity Infrastructure

Distribution Automation

Substation Automation

Distributed Energy Resources

Digital Twins*

* According to IT Gartner, a digital twin is a digital representation of a real-world entity or system. See more here.

Cisco and Digital Energy Infrastructure

Cisco works on many digital twin projects - from the automation of ports to increasing manufacturing OEE (Overall Equipment Effectiveness):

- Introducing device logging, encryption and threat analytics can transform the network into a security tool.

- A secure network can deliver trusted real time visibility across all devices operating within the grid.

We are assisting our clients to achieve a more connected and data-driven grid, which offers significant benefits:

- To revitalize the network with new hardware, segmentation and security, as well as boost network performance and minimize downtime or delays.

- Cisco's Customer Experience team and partners in ConvergeOne deploy switches, routers, and DNA Center appliances.

- The enterprise firewall and round the clock device security minimizes risk and time spent by the technical team on fixing issues failures.

Case Study 1: Working with Evergy to transform data networks

USA
Kansas

ISSUE – Revitalize network with new hardware, segmentation and security, as well as boost network performance and minimize downtime or delays.

SOLUTION – Cisco Customer Experience team and partners in ConvergeOne to deploy switches, routers, and DNA Center appliances.

RESULTS

- ✓ A modern, flexible, and scalable infrastructure, with a future-ready network geared for performance and secure access

- ✓ The new Cisco solution has positioned Evergy to support a converged infrastructure across multiple sites

- ✓ The enterprise firewall and consistent device security minimize risk and time spent by the technical team on fixing issues failures

CISCO   evergy

Cybersecurity in the Energy Sector

For the energy sector, increasingly prevalent concerns around the cyber security of the utility grid and the associated operational monitoring and control networks have led to regulatory mandates on a global level. Organizations simply cannot modernize the utility grid without:

- Asset visibility

- Controls to mitigate attacks

- Cooperation between Information Technology (IT) and Operations Technology (OT)

A well implemented and operationally effective security posture requires a partnership between IT and OT and starts at the network. Energy providers can improve industrial cybersecurity and compliance for the network via:

- Asset inventory and discovery

- Secure access at the edge

- Security incident containment

- Threat detection and mitigation

- Malware protection

Essential Cyber Services for Energy Infrastructure

Incident Response

Network Segmentation

Threat Detection & Mitigation

Authentication & Authorisation

Network and Information System Security Directive (NIS 2)

- The Network Information Security (NIS 2) Directive entered into force on 16 January 2023.

- EU Member States have until 17 October 2024 to transpose it into national law.

- Under the new Directive, a wider subset of actors in the energy ecosystem face new security requirements across **electricity, oil, gas, district heating and cooling** and **hydrogen**, as well as vendors in their supply chain.

- To comply with NIS 2 upon its transposition in respective Member States, energy firms will have to enhance their cybersecurity capabilities accordingly, for example:

  - Shorter deadline on incident reporting will likely put pressure on incident response capabilities
  - New liabilities for company executives
  - Stricter penalties for non-compliance (up to 2% global annual turnover)

EU Cybersecurity Strategy
Cyber and physical resilience

Cisco and Energy System Cybersecurity

A single system is easier to maintain, more reliable and trusted, with fewer integration costs and ongoing operational costs, specifically:

- A comprehensive security architecture with proven integration is a more operational and cost-effective answer.

- Integrating IT and OT around security and leveraging the experience of IT with implemented systems provides a holistic cybersecurity architecture to protect utility networks and processes while addressing the key security and compliance concerns of the utility grid operators.

- A pervasive, highly available, and well-designed communications network will help enable increased reliability and availability while also reducing operational expenses.

Case Study 2: Cisco Talos Intelligence tracking the Lazarus APT Group

ISSUE – A campaign operated by the Lazarus APT group (attributed to North Korea by the US government) exploiting vulnerabilities in VMWare Horizon to gain an initial foothold into targeted organizations, including energy providers.

SOLUTION – Researchers, analysts and engineers from Cisco's Talos Intelligence Group has been closely tracking these activities.

RESULTS

✓ Talos has discovered the use of two known families of malware in these intrusions — VSingle and YamaBot.

✓ Talos has also discovered the use of a recently disclosed implant called "MagicRAT" in this campaign.

ACTOR PROFILE

Lazarus Group

TALOS

Aliases	Hidden Cobra, APT38
Affiliations	North Korea
Active since	2010
Goals	Espionage, data theft, disruptive attacks and financial gain to support state objectives, including political and national security, military research and development and evasion of international sanctions.
Victimology	Broad targeting of entities globally, including government, defense, finance, media and critical infrastructure entities.
Notable TTPs	Exploitation of known vulnerabilities, social engineering techniques, spear-phishing, data exfiltration, custom malware and pseudo-ransomware/wipers.
Malware & tooling	Lazarus employs a variety of custom, self-developed malware families it uses exclusively, including RATs, wipers, backdoors and DDoS botnets. Notable threats include WannaCry, MagicRAT, TigerRAT, YamaBot, VSingle and CRAT.

Accelerating the Digital Transition through Skills

As the energy system is becoming increasingly digital, the demand for highly-skilled individuals has increased. Green-tech skills are increasingly sought-after by companies as they seek to take advantage of the twin green-digital transition.

Amongst other goals to contribute to the EU Pact for Skills, **Cisco's Networking Academy (NetAcad)** has pledged to train **250,000** people with cybersecurity skills across the European Union by 2026 through the Skills for All platform. To date through NetAcad, Cisco has helped **17.5 million** students enhance their skillsets in:

Cybersecurity   **Networking**   **IoT**

Programming   **Infrastructure Automation**

Cisco as a Skills Partner

For the new, digitalized energy sector, countless new skills will be needed to deliver on all of the possibilities that technologies offer, particularly when we consider that data analytics and wireless networks are changing the way utilities operate.

Workforces need to have the skills to monitor, diagnose, and fix energy systems faster and more efficiently.

## Case Study 3: Cisco Networking Academy

WHO – The Cisco Networking Academy is one of the world's longest running skills-to-jobs programs, offering tech education through strong public-private partnerships, a high-quality curriculum, and inclusive workforce development programs.

WHAT – NetAcad celebrates educating the learners who connect the world in collaboration with our unmatched ecosystem of partnerships including governments, academic institutions, and nonprofits.

HOW – Courses are designed to equip learners with the skills required by industry, using gamification, assessments, and problem-solving to support learner success.

RESULTS

✓ NetAcad has educated **17.5 million** students since 1997.

✓ **29,300** educators have participated in NetAcad worldwide.

✓ **11,800** organisations offer our courses.

✓ We serve learners in **190 countries**.

✓ **95%** of our students obtained a job and/or new educational opportunity.
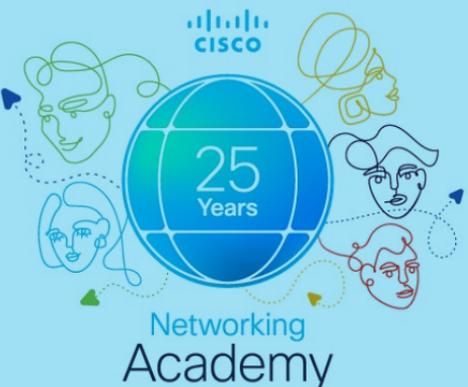
Digital Innovation in Energy

Energy utilities today face demands of a rapidly transforming industry, not only must they ensure constant reliability and availability of power, they also must adhere to stringent security regulations and meet power grid management requirements.

As with every industry, digital innovation is transforming how the energy industry operates and develops, with the main areas of development being in:

· Improving efficiency

· Reducing costs

· Enhancing sustainability

Cisco recognizes that in order to thrive in the new era, utilities will need to invest in more efficient, automated, and resilient energy grids. Strategy-minded utilities are increasingly planning for a future based on IT and smart grid applications that require advanced telecommunications systems.

· Technology is enabling the grid's transformation, connecting energy ecosystems, and optimising production and demand.

· IP-based, packet-switched networks will form the backbone of these new systems, providing system interoperability and enabling a spectrum of new applications that improve grid security, control, and automation.

Digital technologies at the centre of the energy transition:

Artificial Intelligence

Internet of Things

5G, LTE & Distributed Field Networks

Blockchain

Driving Digital Innovation in the Energy Sector

By using predictive analytics to better anticipate the future, data to better inform current decisions in the here and now, and digitization and automation, utilities and companies can greatly improve efficiency and add significant value for their operations:

- Advanced metering infrastructure can help utilities enable more effective demand response, fast outage notification and prevent power theft.

- Enhanced grid cyber security can secure operations comprehensively and meet regulatory requirements with a series of simple steps.

- Investing in mobility and scalability allows for benefits, such as in-vehicle networking as well as other remote expert applications.

Case Study 4: Innovative solutions for BKK's power grid

Norway

ISSUE – A power grid owner aiming to transition legacy utility communications network to packet-based IP network to improve efficiency and support business-critical teleprotection capabilities.

SOLUTION – Building a reliable and efficient network that crucially also provided greater flexibility as new grid applications require any-to-any communications flows.

RESULTS

✓ Significant cost savings and increased bandwidth

✓ Ability to offer the same network resources at substations as at corporate office locations

✓ Ensuring the company was IoT ready

CISCO BKK

Controlling the Energy Use of the ICT Sector

As companies set ambitious emissions reduction targets to reach net zero, technology will play a central role in driving emissions reduction, and therefore the digital technologies and infrastructure that the energy sector relies on need to be designed with sustainability and energy-efficiency in mind.

In response to energy costs, environmental concerns, and government directives, there is an increased need for IT operations that are designed with sustainability in mind. Innovative network management solutions are key for all of the following:

- Distribution efficiency
- Increased resilience
- Reducing costs
- Transforming to smart grids
- Allowing for more effective operation management
- Improved platform-based customer services.

Cisco recognizes the need for a global approach to tackling ICT energy use and supports leading global technology companies adopting an open and collaborative approach to reaching net zero in this sector.
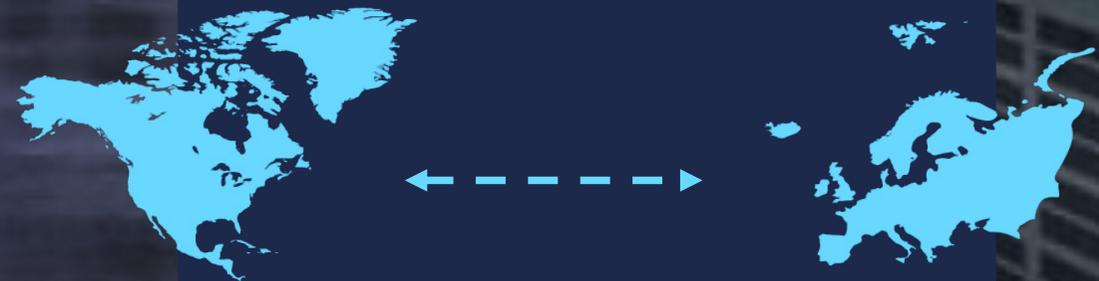
Cisco Technologies Helping to Reduce ICT Energy Usage

Leading in energy efficiency innovation is a key priority in Cisco's approach to sustainability – both for our own operations and those of our customers. In order to advance our sustainability priorities, we adopt the following core principles:
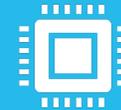
Key ingredients for a successful transition:

- Energy management to streamline hardware
- Reducing data centre energy consumption
- Optimisation of heating, ventilation and air
- Modular computing systems

Case Study 5: Cisco's Approach to Data Centre Sustainability

In recognition of our role as a major ICT company and as part of our overall commitment to sustainability, Cisco has been taking a number of steps to make our global data centers more sustainable.

SOLUTIONS:

- Designing with sustainability in mind
- Optimized operations
- Energy management
- Asset recovery and reuse

RESULTS (since 2022):

- **72%** renewable energy powering all global data centers
- **38%** fewer data centers
- **40%** reduction in data center power capacity
- **58%** of server cabinets removed from service and redeployed
- **43** tons of cabling infrastructure / equipment reused and saved from e-waste

Reducing Carbon Emissions is a Collective Effort

At Cisco, we know that no company can achieve meaningful climate ambitions acting in isolation. Therefore our approach is to work in partnership with industry, nonprofits, and governments, building coalitions and an inclusive ecosystem to strengthen our impact.

With our **Country Digital Acceleration Program**, we have powered more than 1000 projects throughout 40 countries, contributing to an inclusive sustainable future by unlocking the value of digitization.

Cisco was a founding partner of the **Ellen MacArthur Foundation**, which facilitates collaboration and knowledge-sharing in the pursuit of a circular economy.

Cisco is also a signatory of the **PACE Capital Equipment Pledge**. We committed to 100% product return, pledging to take back used equipment from any customer free of charge and grow the reuse of equipment through refurbishing, remanufacturing, and repair.

Since 2021, Cisco is a proud member of the **European Green Digital Coalition**, an EU-led initiative gathering 37+ companies looking at enabling emission-reducing potential of digital solutions to all other sectors, including energy.

In 2021 the **Cisco Foundation** committed to invest US$100 million over the next 10 years in innovative climate solutions that drive forward regenerative economies.

Cisco Supporting the Energy System Transformation

Digitalizing the energy system is a crucial step in the climate transition, not only in ensuring that the energy sector works better for consumers but more importantly also works better for the planet and its resources. As demonstrated above, there are a number of core areas where investment can be made to modernise, upgrade and innovate the energy system:

Investing in electricity infrastructure to deliver efficient and automated operations

Building an energy system that is resilient and protected from cyber attacks

Supporting efforts to equip Europe's economy with the skills and people needed for accelerating the energy transition

Taking advantage of cutting-edge technologies and integrating them into the energy system

Cisco looks forward to working with policymakers, public officials, utilities and the private sector to ensure that Europe's energy system continues to evolve and transforms itself to be able to meet the ambitious goals of the EU Green Deal.

Cisco is keen to work collaboratively with organisations – public and private – working on energy digitalization, particularly in the context of the EU Action Plan on Digitalizing the Energy System. This includes everything from TSOs (transmission system operators) and DSOs (distribution system operators) working to create a digital twin of Europe's energy system, to national regulatory authorities working on common principles, as well as working groups focused on energy cyber security and universal guidelines on data centre sustainability, and more.

Annex of Resources

Read more about:

Cisco Energy Industry Solutions: **https://www.cisco.com/c/en_uk/solutions/industries/energy.html**

Cisco TALOS Cybersecurity Intelligence: **https://www.talosintelligence.com/**

Cisco and Innovation: **https://blogs.cisco.com/innovation**

Cisco Networking Academy: **https://www.netacad.com/**

Cisco's Skills Pledge: **https://skillsforall.com/**

EU Action Plan to Digitalize the Energy System: **https://ec.europa.eu/commission/presscorner/detail/en/ip_22_6228**

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