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Digital Talk Energy

Siemens.pt/digitalizacao

The Digital (r)Evolution

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Siemens has been at the forefront since the beginning of the Industrial Revolution

1st Industrial Revolution

2nd Industrial Revolution

3rd Industrial Revolution

4th Industrial (r)Evolution

Digitalization

Water & Steam

Electrification

Automation

disruption occurred

disruption underway

disruption beginning

Media

Consumer packaged goods

Healthcare

Energy
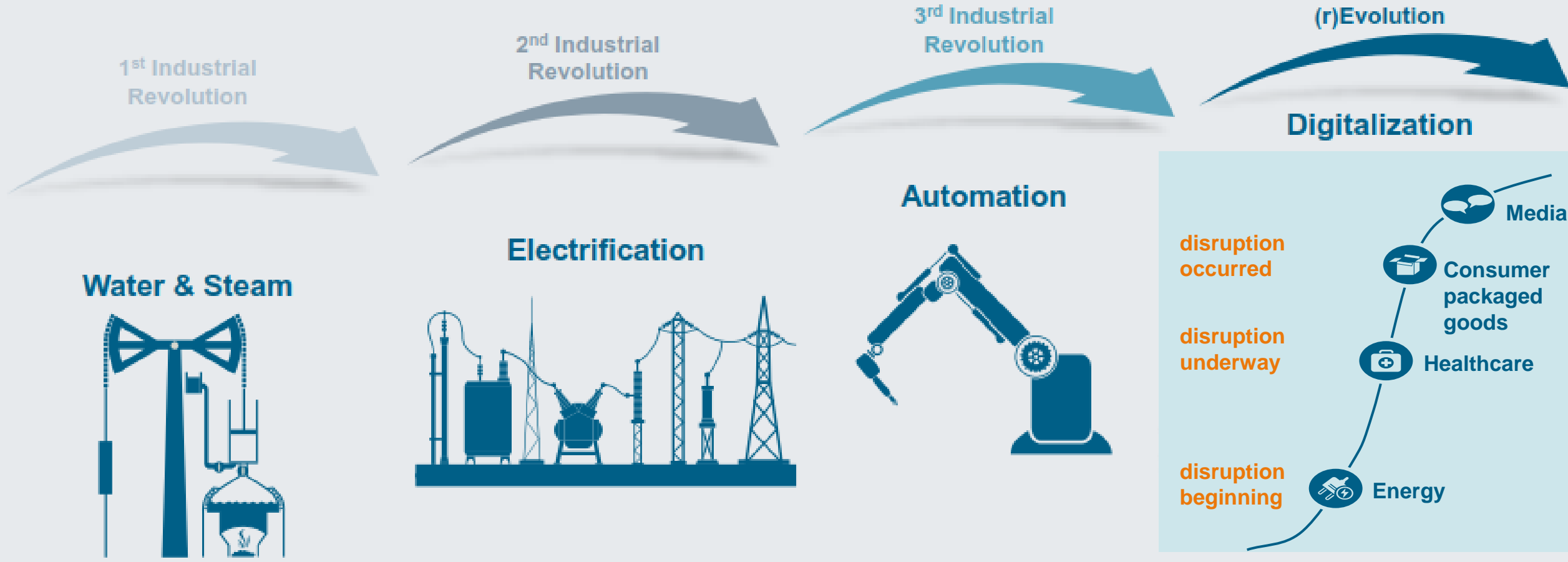
Digitalization –
Optimizing the entire lifecycle

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Design/engineering	Installation/commissioning	Operation/maintenance

3D virtual reality visualization
e.g. Installation & Maintenance

Data analytics
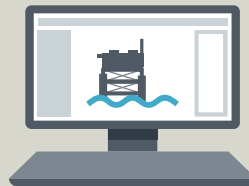e.g. Asset Life Predictions

Integrated engineering

Integrated operation

Additive manufacturing
e.g. Spare Parts

Integrated operations
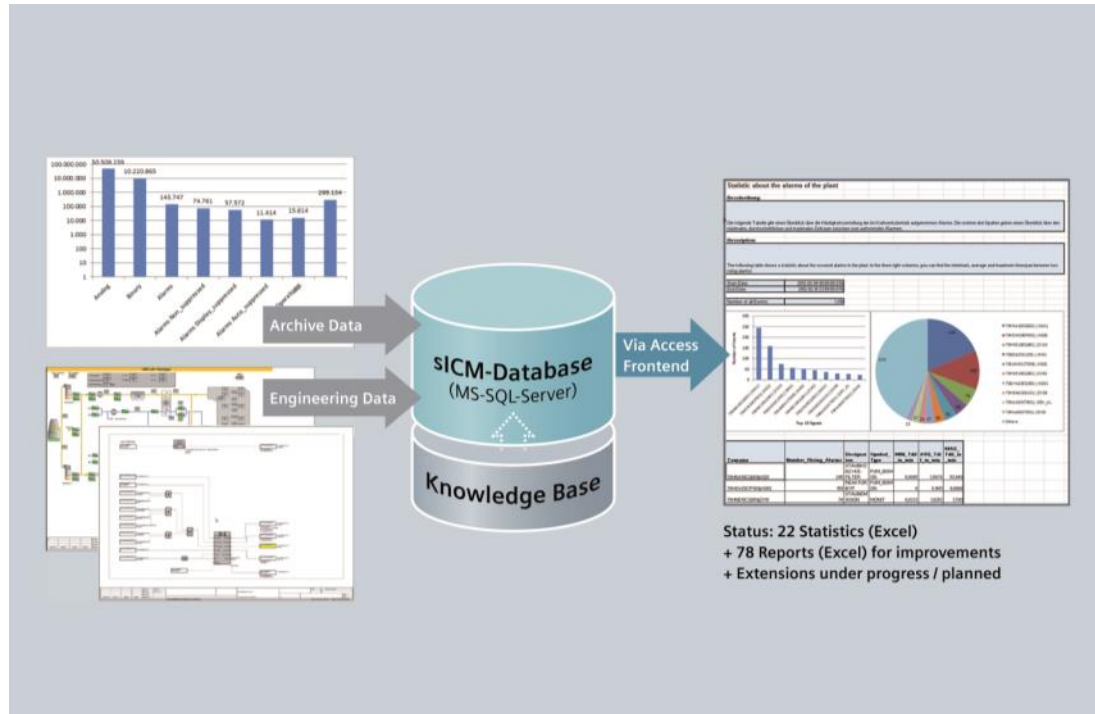e.g. Offshore platform in real-time from onshore
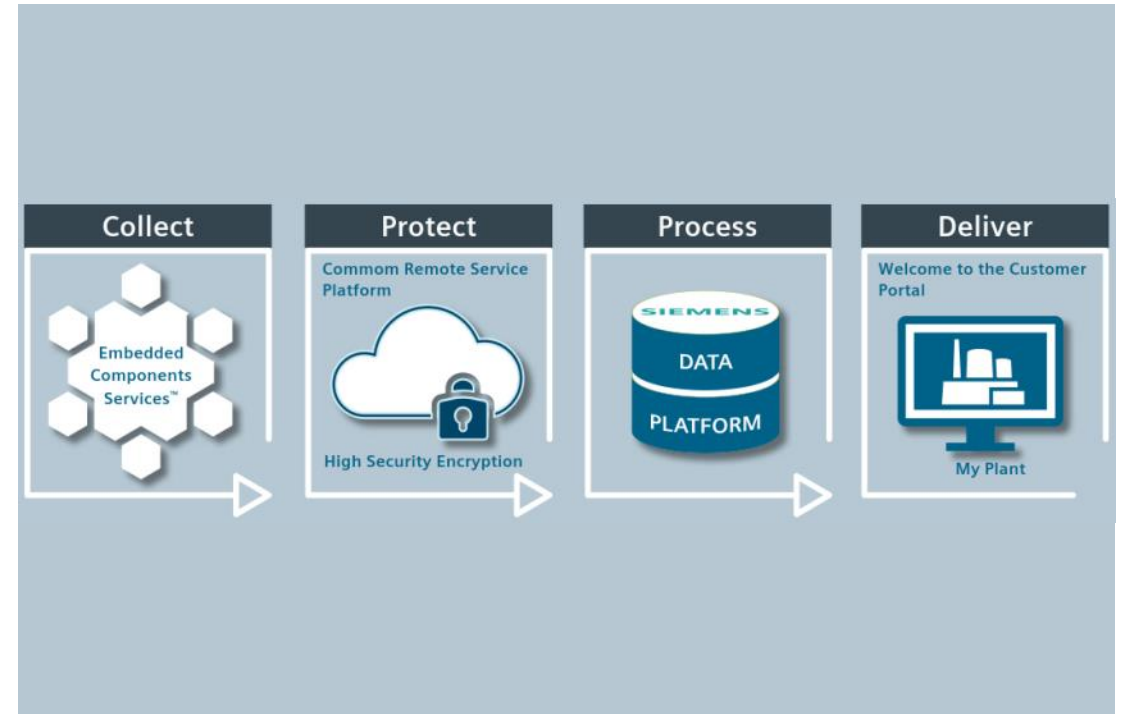
Service
e.g. Flexible Outages

The Challenge
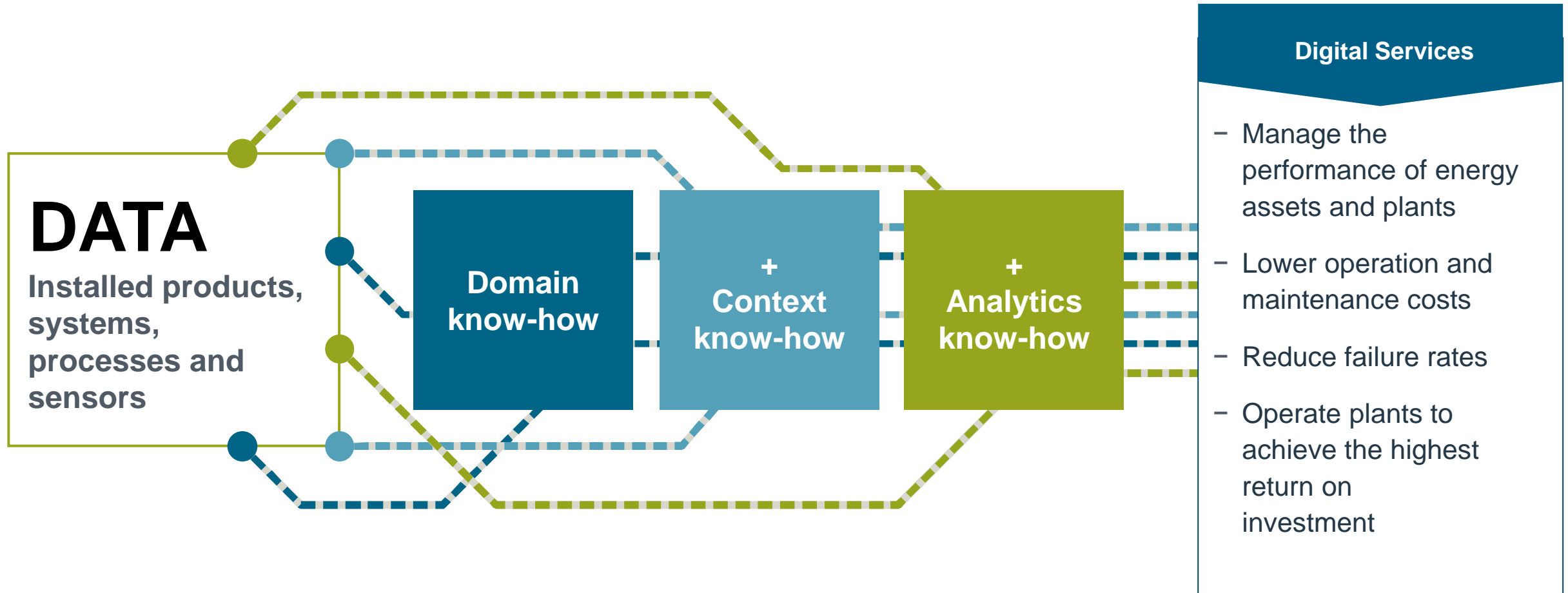## From the classic approach to a comprehensive digital solution

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"Classic" approach

Status: 22 Statistics (Excel)
+ 78 Reports (Excel) for improvements
+ Extensions under progress / planned

The digital approach

Digitalization Transforms
How services are delivered & creates value

DATA

Installed products, systems, processes and sensors

Domain know-how

+ Context know-how

+ Analytics know-how

Digital Services

- Manage the performance of energy assets and plants
- Lower operation and maintenance costs
- Reduce failure rates
- Operate plants to achieve the highest return on investment

Omnivise Digital Services: Customer value drivers define Siemens Power Generation portfolio structure

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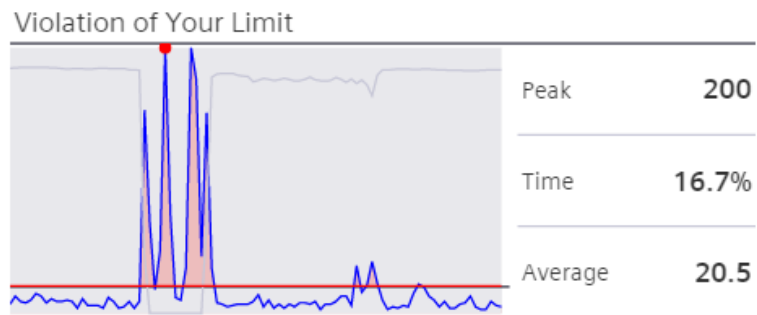
Partnership Value Program	Share Value	**Covering**

Solutions, Software, Services

Performance	*Availability*	*Operational Cost*	*Risk & Compliance*
Omnivise Fleet Management			**Omnivise Risk and Compliance** • Cyber Security • Environmental compliance
	Omnivise Remote Support		
Omnivise Performance	**Omnivise Availability**	**Omnivise Operational Efficiency**	

Units

Plants

Fleets

Transparency	Omnivise Connect

Digital Lifecycle Services
Turn operational data into plant improvement

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KPIs

Violation of Your Limit

Peak	200
Time	16.7%
Average	20.5

Average 20.5 alerts/h

Your Optimization Potential in Comparison

Median 1.00   Best 0.28

High ←→ Low

You: 0.56 | 20.5 alerts/h

Check Your Optimization Potential

High
Medium
Low

40
20

caused 44.22 % alerts/h

Improved top alerts   5
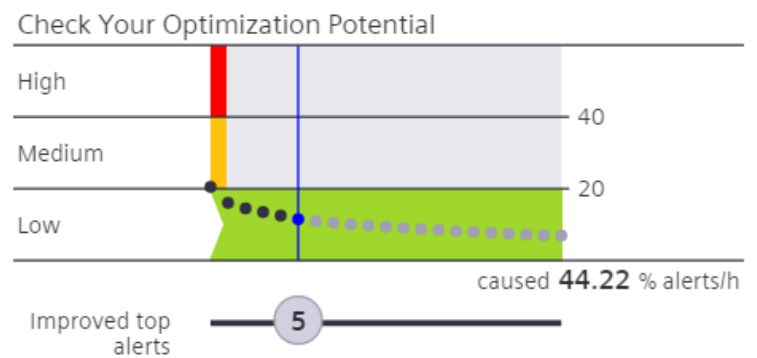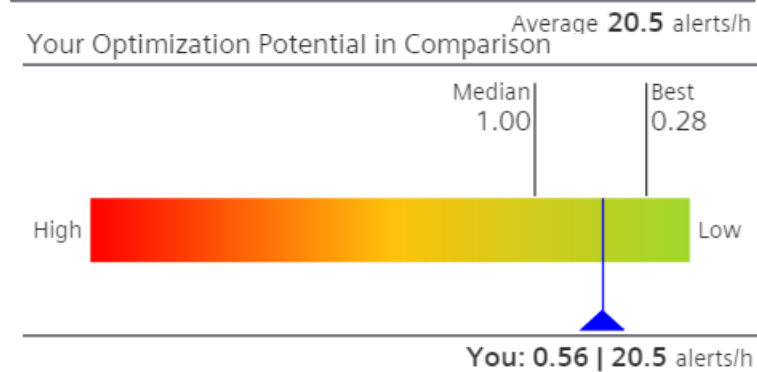
Recommendations

Alert Load Reduction

| | | 1. | W 6746 alerts | 2. | W 6743 alerts | 3. | W 4068 alerts | 4. | I&C 2459 alerts | 5. | T 1859 alerts | 6. | W 1740 alerts | 7. | T 1! a |

10PAD13AA001||XB48

Module	ACTUATOR	Min Time	0.80
Port	TRBL	Avg Time	2362.83
Active Alarm Text	DEF CDV $ FDR FLT	Max Time	34662.38
Description	V-DIST D'EAU CIRC 13		

Root Causes & Recommendations

> Detailed Analysis Data

> 1. Root Cause: Problem from MCC

> 2. Root Cause: The drive has lost its end-position 'closed' without a command

> 3. Root Cause: The drive has lost its end-position 'opened' without a command

> 4. Root Cause: Drive did not reach its final position 'closed' within the monitoring time

Instrumentation & Edge Services
# Increase Operating Life & Cut Maintenance Costs

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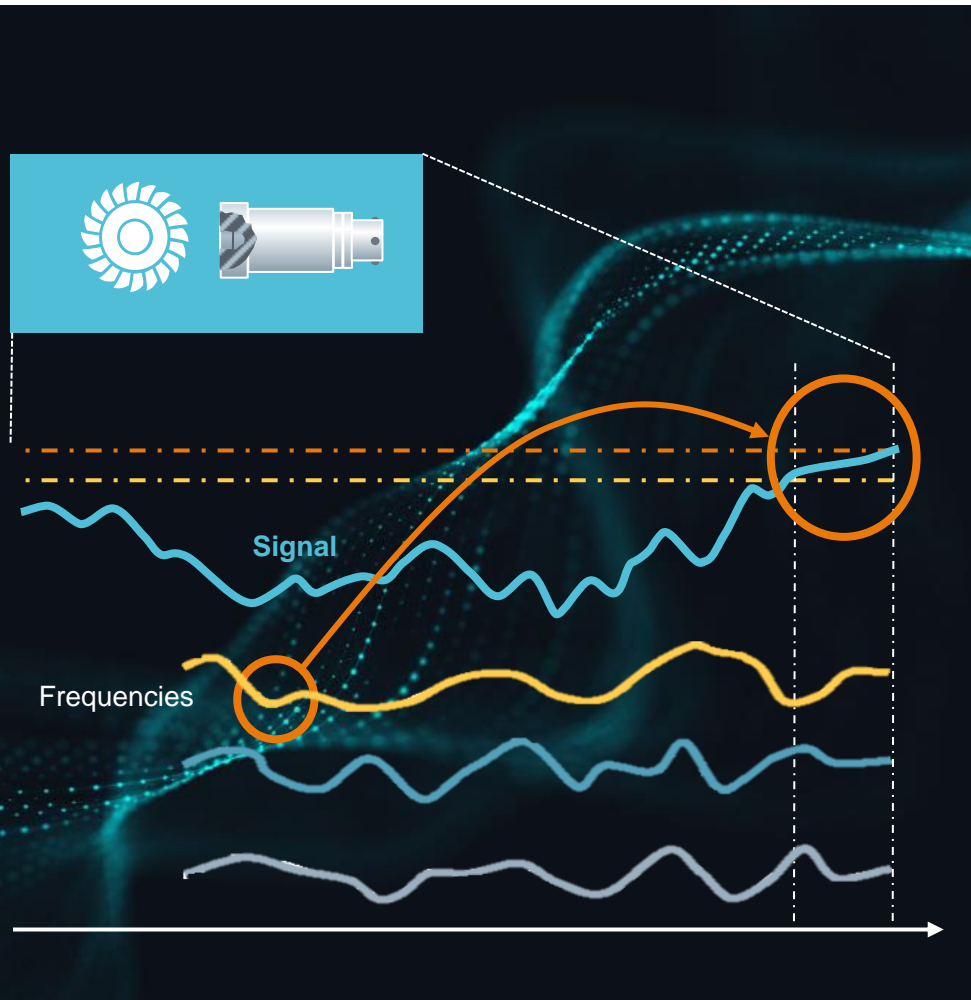
Just In Time Analytics to Optimise your Plant to
Reducing Maintenance Costs and Increase Operation Life

- **MACHINERY PROTECTION**
  Reliably detect undesirable machine states to avoid unnecessary tripping

- **MACHINERY MONITORING & ANALYSIS**
  Immediately detect abnormal machine performance and its root-cause at the earliest possible stage

- **PROCESS MONITORING & ANALYSIS**
  Draw upon archived plant experience to recognise creeping faults long before they reach a critical point

Performance Optimisation Services
Adapt Plant Operations to Current Requirements

2 On-site analysis

1 Initial assessment

3 Evaluation

4 Implementation
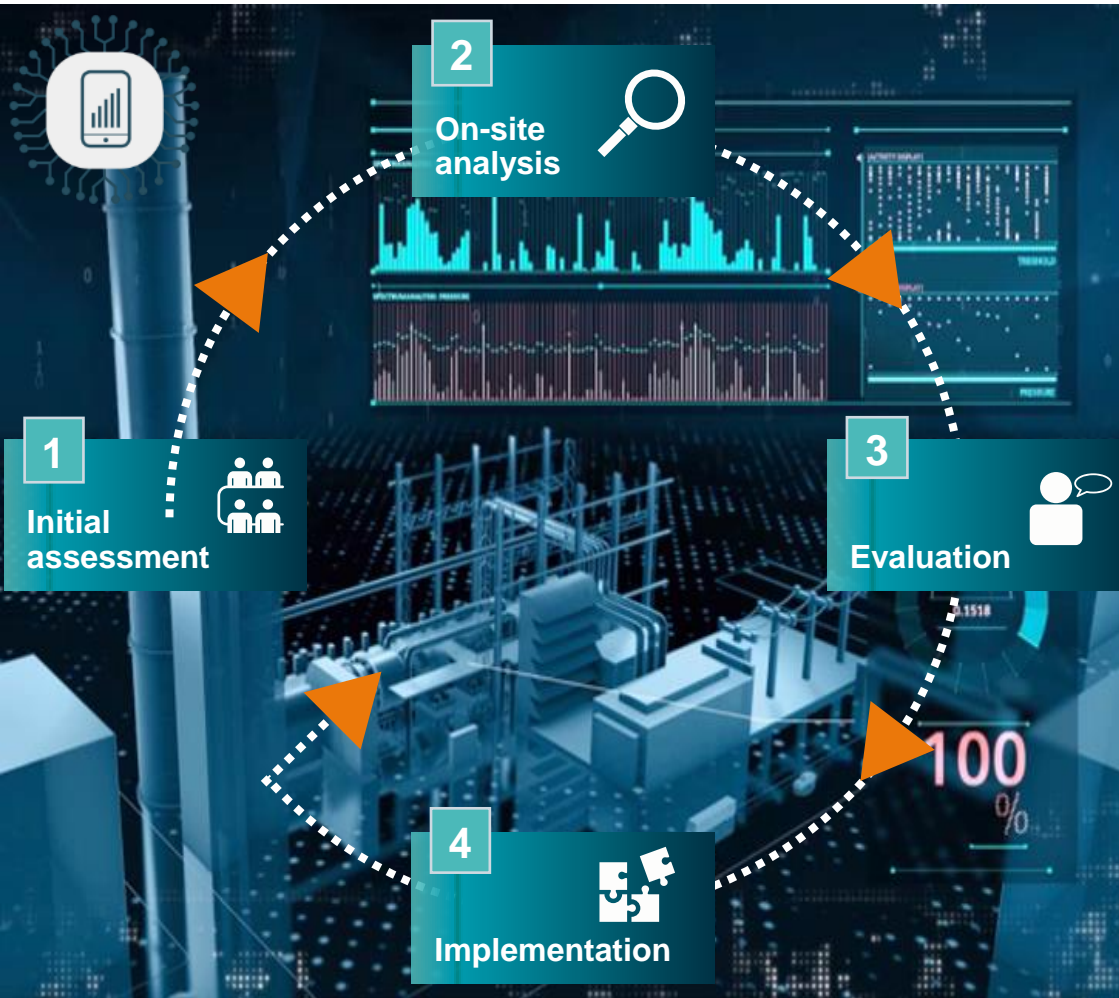
No matter what is demanded in your specific generation environment

High Availability, e.g. in power demanding markets

High Flexibility, e.g. in volatile markets

High Efficiency in power demanding markets with low generating capacities

Low Emissions, e.g. in environmentally conscious and regulated markets

Process optimisation solutions enable to run your plants according to demand requirements

4-Step Approach

1. **Internal Assessment** - Determine solution modules to fit individual needs / requirements
2. **On-Site Analysis** - Identify, localize and quantify existing potential
3. **Evaluation** - Presentation of expected results including profitability
4. **Implementation** - Engineering based on comprehensive power plant know-how

Fleet Center Solutions: Bundle efforts and get the most out of your assets

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Operations Optimization

Business Optimization

MONETIZE Opportunities – Leverage synergies and exploit asset heterogeneity within the fleet

Building on existing infrastructure, **Fleet Center Solutions can turn data into actionable knowledge** and provide transparency on the entire fleet.

Fleet Center Solutions bring along the integrative means to **centrally manage, diagnose and monitor fleet-wide assets** and to **market fleet capacity**.

Fleet efficiency: up to 3 – 4% potential ↑
Maintenance costs: more than 10% potential ↓
Start-up reliability: up to 98% potential ↑
Manual operator action: up to 80%? potential ↓

Reduce Risk

"…We are pleased with the increase in cyber security capability associated with the Siemens Security Solution… we plan to budget for the Siemens Security Solution at our three other Siemens sites…"

Compliance
Meet NERC CIP regulations

OT cyber security
Comprehensive security solution for plant reliability

Step 1
Evaluate
- Gap assessment
- Security Program Standup

Step 2
Implement
- Whitelisting Deployment
- Security aware-ness Training

Step 3
Test
- Cyber vulnerability assessment

Step 4
Monitor & Maintain
- Patch mgmt. and malware updates
- Intrusion detection
- Event monitoring

1950s – 1960s
Military, governments and other organizations implement computer systems

1980s
Computers make their way into schools, homes, business and industry

1999
The globe is connected by the internet

2010s
Cloud computing enters the mainstream

2020s
Internet of Things, Smart and autonomous systems, Artificial Intelligence, Big Data

Digital Information Processing

Digital Connectivity

Digital Automation and Intelligence

1970s
Home computer is introduced

1990s
Digital enhancement of electrification and automation

1991
The World Wide Web becomes publicly accessible

2000s
Mobile flexibility

2020s
Industry 4.0

Industroyer/Chrashoverride
Heartbleed
Stuxnet
WannaCry
Melissa Worm
ILOVEYOU
Morris Worm
AT&T Hack
Blue Boxing
AOHell
NotPetya
Cryptovirology
Cloudbleed
Level Seven Crew hack
sl1nk SCADA hacks
Infineon/TPM
Denial-of-service attacks
Meltdown/Spectre

We sign for cybersecurity!
We sign the Charter of Trust.

Charter of Trust

SIEMENS   AES   AIRBUS   Allianz   Atos   enel

DAIMLER   IBM   Munich Security Conference msc Münchner Sicherheitskonferenz   NXP   SGS   ᐧᐧ T ᐧ

Charter of Trust for a secure digital world

Siemens partnering with ENEL to pilot a fleet-wide best-in-class monitoring solution

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Siemens advanced cyber security solution for Utilities

Fleet Cyber Asset Management Service

PAS

Vulnerability Management

tenable
network security

Plant Security Monitoring

DARKTRACE
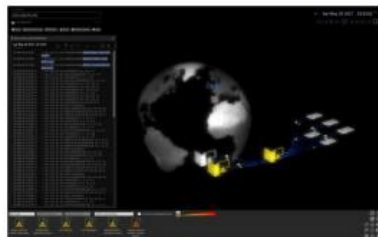
Best-in-class monitoring solution by Siemens

ENEL plant
- Existing Siemens EHM solution
- In-depth know-how of asset performance

Pilot scope & Deployment

Visualized attack surface to pinpoint location of anomaly on site

Integrated operational data displaying process variation within defined tolerances

Detailed anomaly detection data, relative risk, and descriptions

- Best-in-class solution: software installation, asset management and monitoring
- Solution for entire fleet of control systems

Result
- Detected vulnerabilities and anomalies with associated hardening measures

Benefits for Customers

- Unmatched asset visibility
- Reduced recovery time
- Automatic configuration management
- Real-time visibility and insights
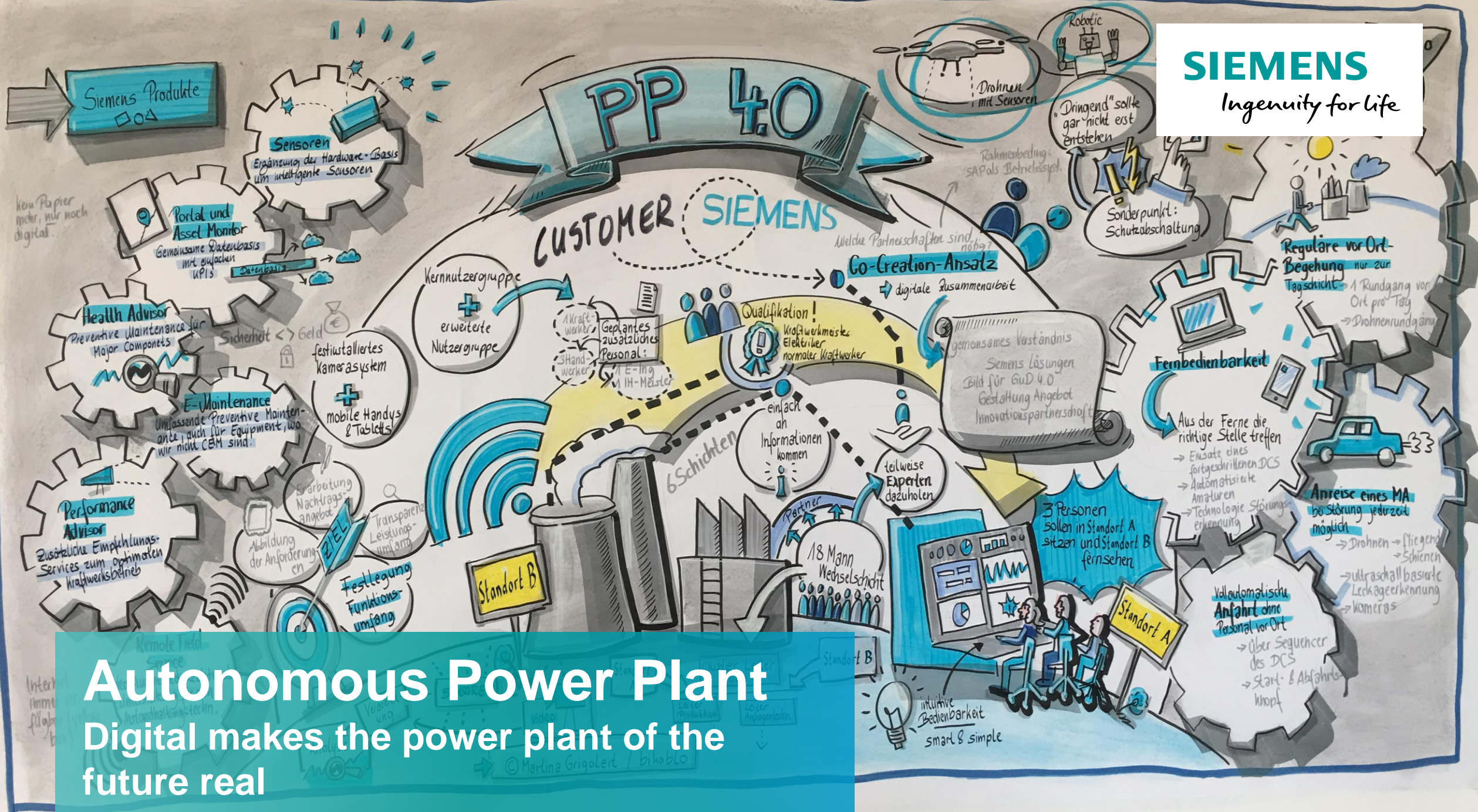- Visualized attack surface
- Detect threats in network
- Unmatched correlation and AI capabilities
- Understanding of cyber threats with OT know-how

Autonomous Power Plant
Digital makes the power plant of the future real

Siemens leverages digital technologies to create power plants of the future

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… with strong product and domain know-how …

… to create value – today and in the future

- Data analytics
- Artificial Intelligence
- Simulation tools
- Cloud & platform technology
- Secure connectivity
- …

Maintain power plant automated and remotely with digital operations management system

Fossil resources

GT   ST   Geno   HRSG   BoP

Consumption

Transmission & distribution

Prosumers

Storage

Co-Creation
Jointly create a new product/ solution

Value Sales
Implementation of existing products fitting to needs

Collaboration
Existing products get adjusted to specific needs

Improving availability

Improving performance

Reducing risk

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Digitalization Day #SAFIR… beyond Digitalization

Siemens.pt/digitalizacao

Digitalization it's changing the world...
What have we been doing?

Ready for the present… Launching the Future
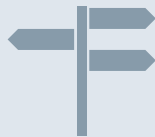
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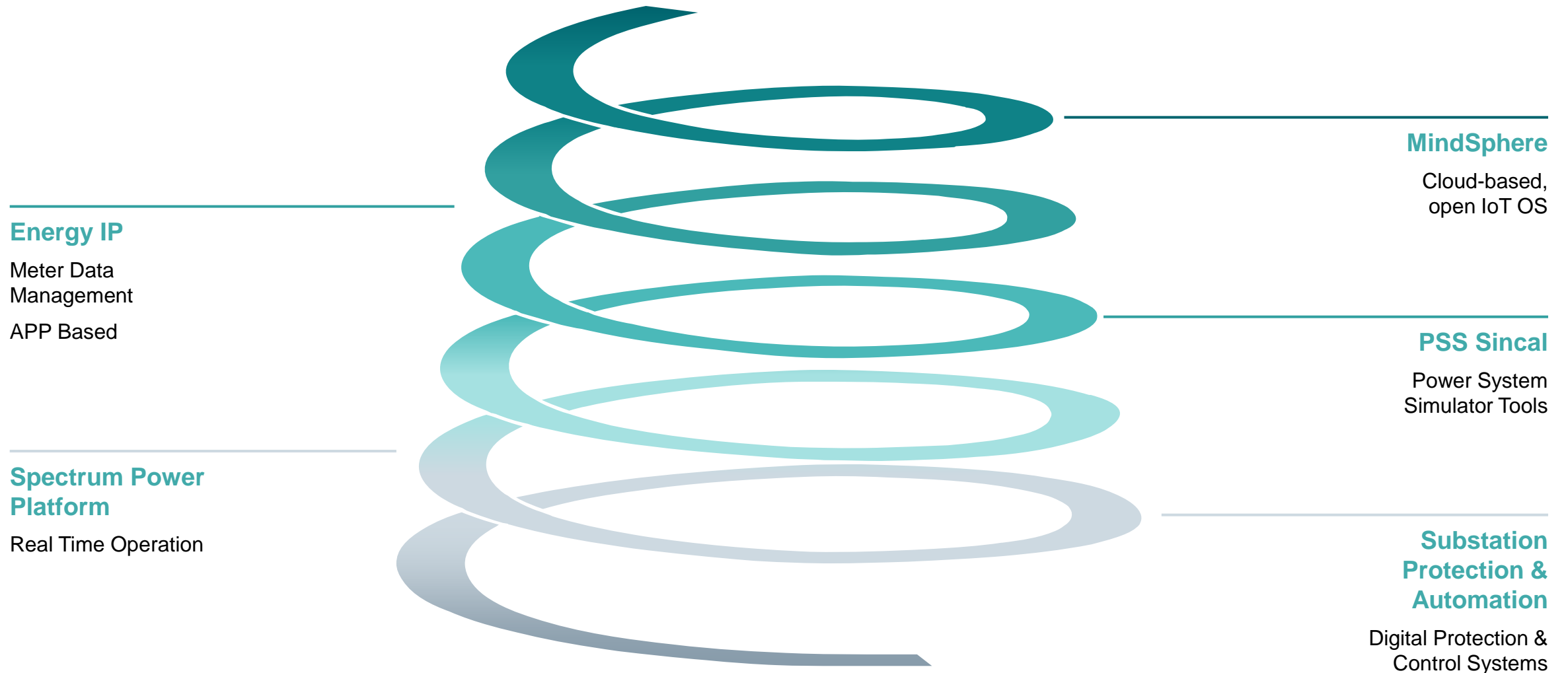**Increasing Digital Data Sources**

Independent Digital Data Acquisition & Archiving

Network Modeling & Simulation – Digital Twin – Safe Network operation

SIEMENS digitalizing the reality… together with you!

MindSphere

Cloud-based,
open IoT OS

Energy IP

Meter Data
Management

APP Based

PSS Sincal

Power System
Simulator Tools

**Spectrum Power
Platform**

Real Time Operation

**Substation
Protection &
Automation**

Digital Protection &
Control Systems

Ready for the present… Launching the Future

Increasing Digital Data Sources

Independent Digital Data Acquisition & Archiving

Network Modeling & Simulation – Digital Twin – Safe Network operation
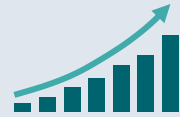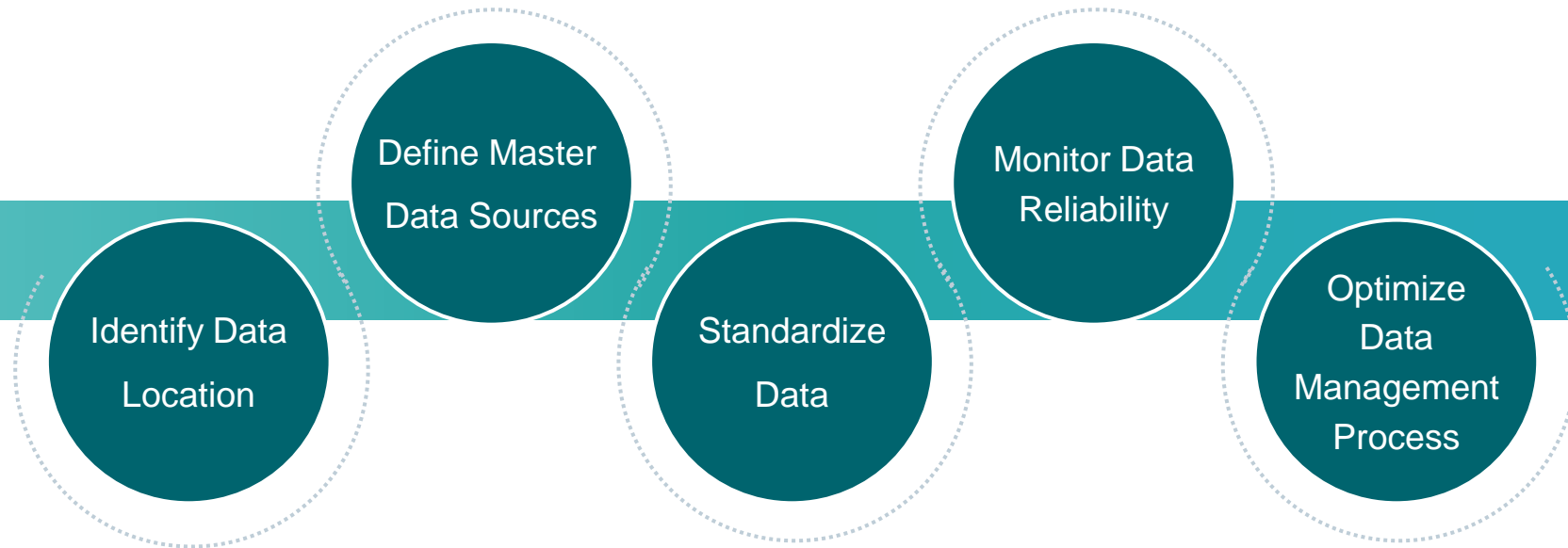
Digitalization

Holistic Optimization… From day 1

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Using SAFIR to review global Corporate & Operational Processes
Data Management Process

Define Master Data Sources

Monitor Data Reliability

Identify Data Location

Standardize Data

Optimize Data Management Process

Immediate Benefits - SAFIR

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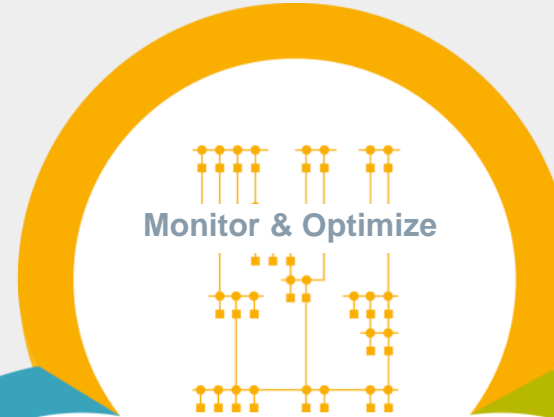
- ✓ **Increase Grid Reliability – Optimize Asset Operation**

- ✓ **Reduce Costs – OPEX (Maintenance Efforts) & CAPEX (Extended Lifetime)**

- ✓ **Optimize Corporate and Operational Processes**

- ✓ **Increase Transparency – Web-based Application, e-mail reports, SMS Alerts**

Statistic & Probabilistic Analysis

AI

What's Beyond?

Extended MindSphere Integration

Challenge us!

What do you mean by Energy Efficiency?

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Energy/
Electrical Power

Input / output

Ratio

Conversion process

Measures

Performance

Reduction/
Optimization
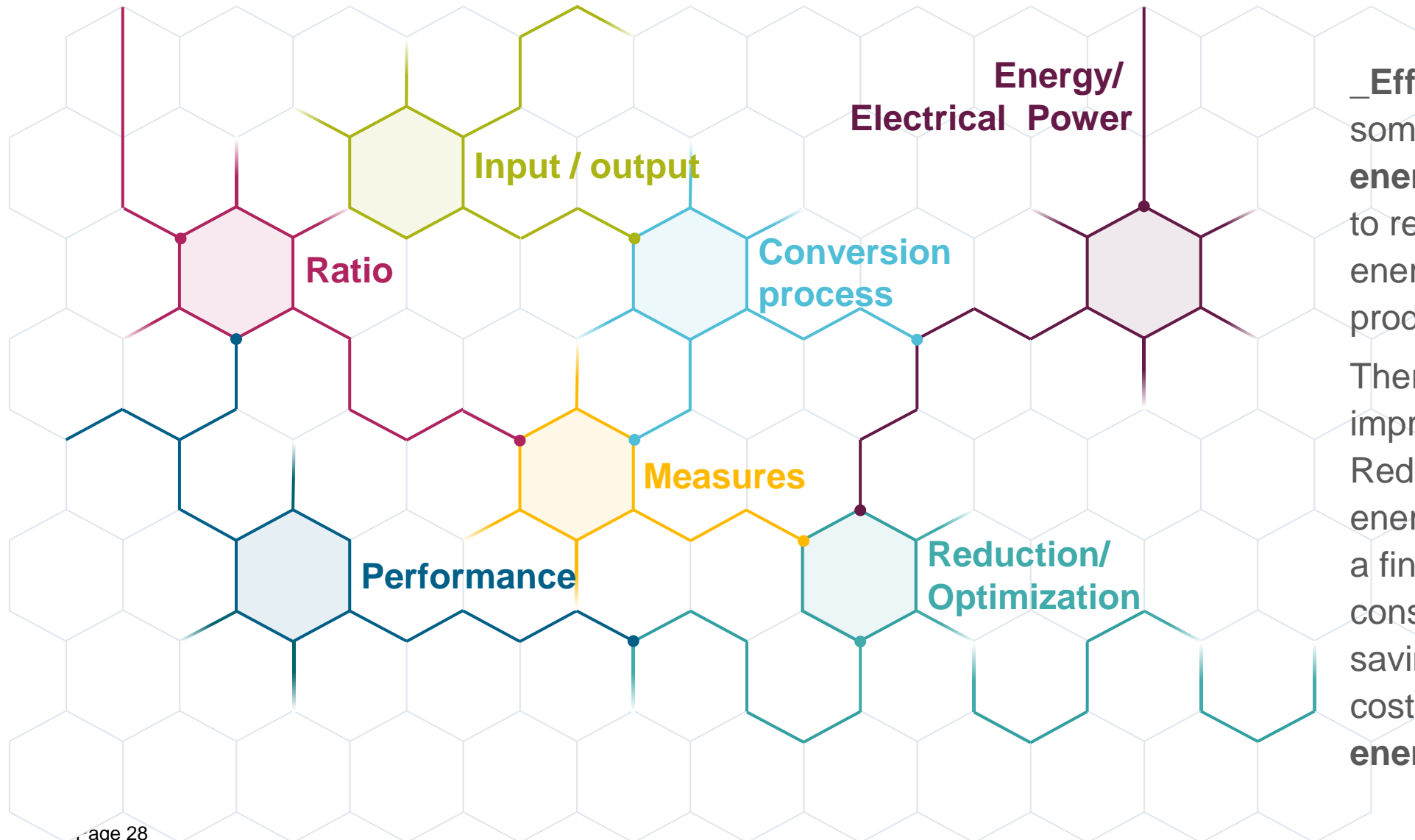
_**Efficient energy use,** sometimes simply called **energy efficiency**, is the goal to reduce the amount of energy required to provide products and services.

There are many motivations to improve **energy efficiency**. Reducing usage reduces energy costs and may result in a financial cost saving to consumers if the energy savings offset any additional costs of implementing an **energy efficient technology**.

Is there a Roadmap for Energy Efficiency Projects?

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_Where to start

Where am I now?
Go Digital or Analog?
Best Effort / Strategic?

_Digital Transformation

Monitor and establish a baseline
Account KW, km/h, ºC, units, bar,…
Collect all info in one single BigData

_Digital Grid Twin

Study and Simulate
Continuous Optimization
Take Control

_Transparency

Need all Elect Measures
Match Consumption/Process
Real-time is a must

_Analytics Foundation

Find Data Patters / behaviors
Assume fails in DataDiscovery
Don't assume / Ignore Bias

_Interface and Engage

No system is alone
Measure the result of an action
keep CyberSecurity in your mind

Paulo Pádua | EM DG SWS

How can I assure a successful EE Project !

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Learn with others | Go Global | Don't invent the wheel | Re-invent your organization | Trust the partner
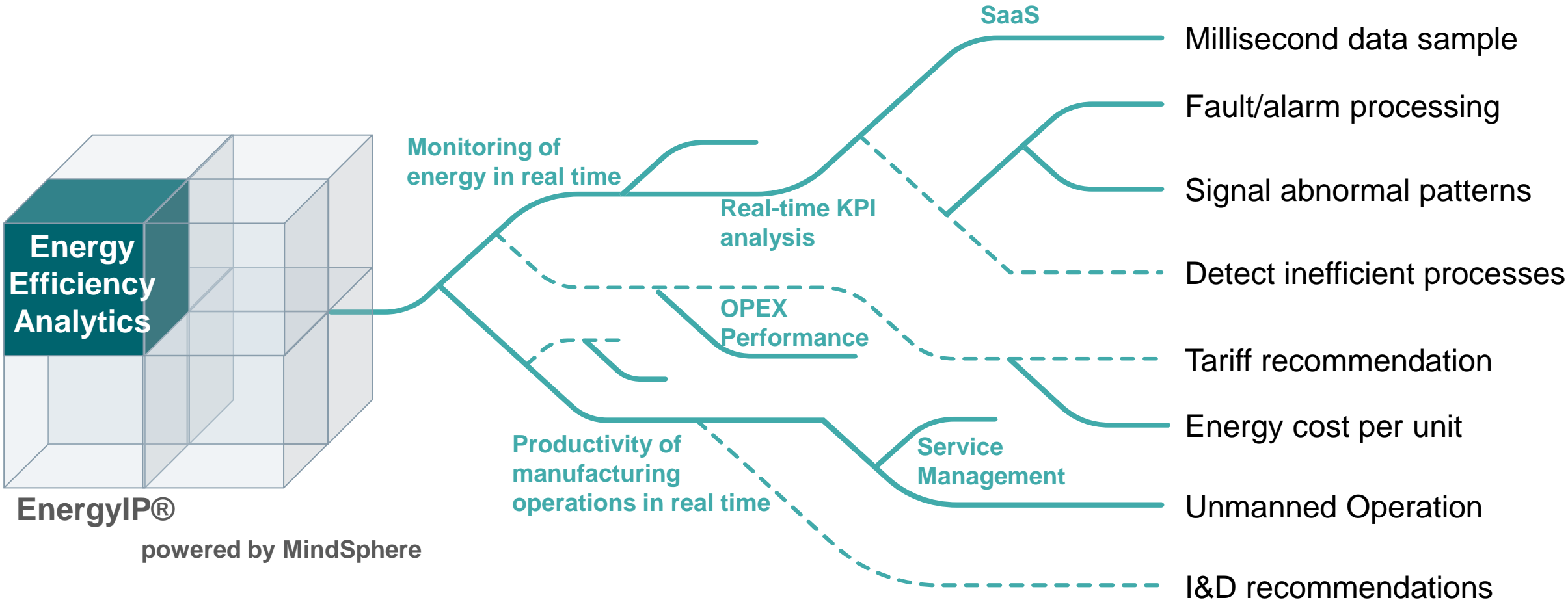
4 _Continuous Implementation of Energy Efficiency measures assure short and long term RoI

3 _The IT and the OT/Process Organization need to be involved

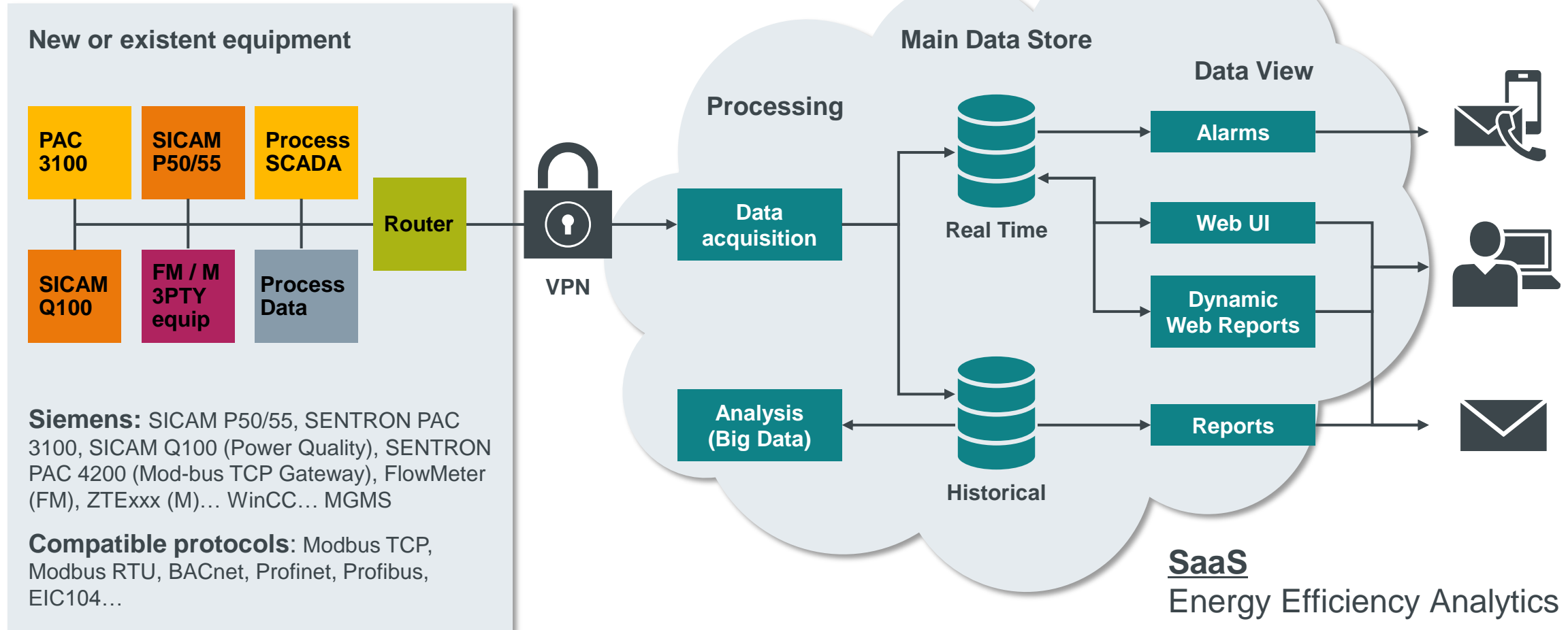**2** _Assure near real-time with high resolution sampling (<1s)

1 _Plan with minimum intrusion | Uninterrupted operation

Paulo Pádua | EM DG SWS

Can Siemens be my trusted partner?

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Energy Efficiency Analytics

EnergyIP®

powered by MindSphere

Monitoring of energy in real time

SaaS

Real-time KPI analysis

OPEX Performance

Productivity of manufacturing operations in real time

Service Management

Millisecond data sample

Fault/alarm processing

Signal abnormal patterns

Detect inefficient processes

Tariff recommendation

Energy cost per unit

Unmanned Operation

I&D recommendations

Paulo Pádua | EM DG SWS

Where is the VALUE for you?

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Solution Benefits

- Enable better energy usage
- Opex Reduction
- Benchmark sites consumption
- Regulatory Compliance
- Process insights
- Faulty equipment Detection
- Reduced Capex

Engagement

- Reduce CO_2 emissions
- Release resources from repetitive work
- Visibility to the organization
- Support Educated Decisions
- Active Actionable reporting
- Increase Productivity

Paulo Pádua | EM DG SWS

Monitor. Analyze. Optimize… your energy usage with Siemens EnergyIP Energy Efficiency Analytics

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15
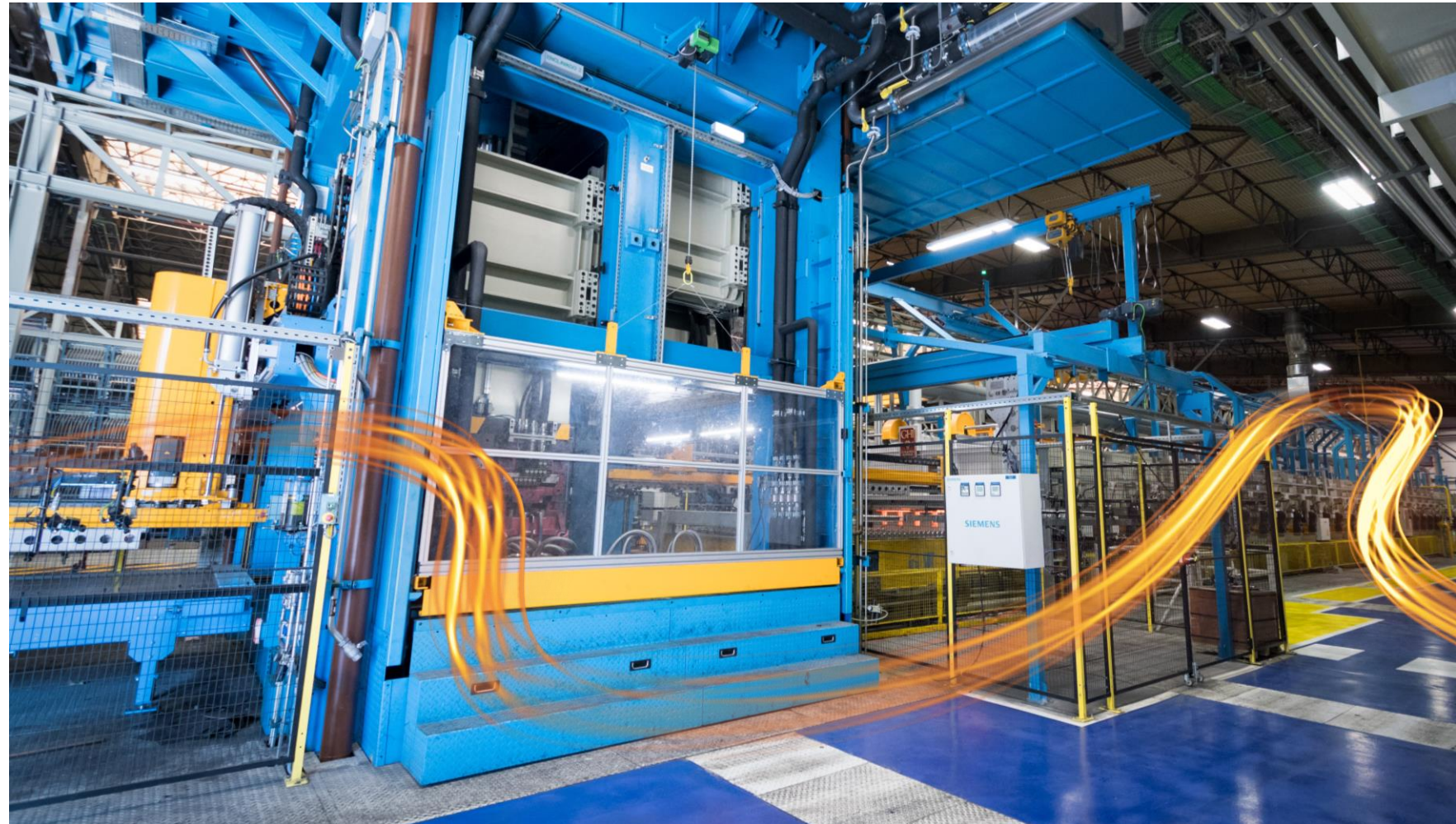Factories in 6 countries

8M
€ saved in energy bills

130
measures implemented

14k
tons of CO_2 saved

15%
energy consumption reduced (50 GWh)