Energy Management and Energy efficiency as-a-service

Erik Madsen og Thomas Brændgaard Nielsen, Siemens A/S

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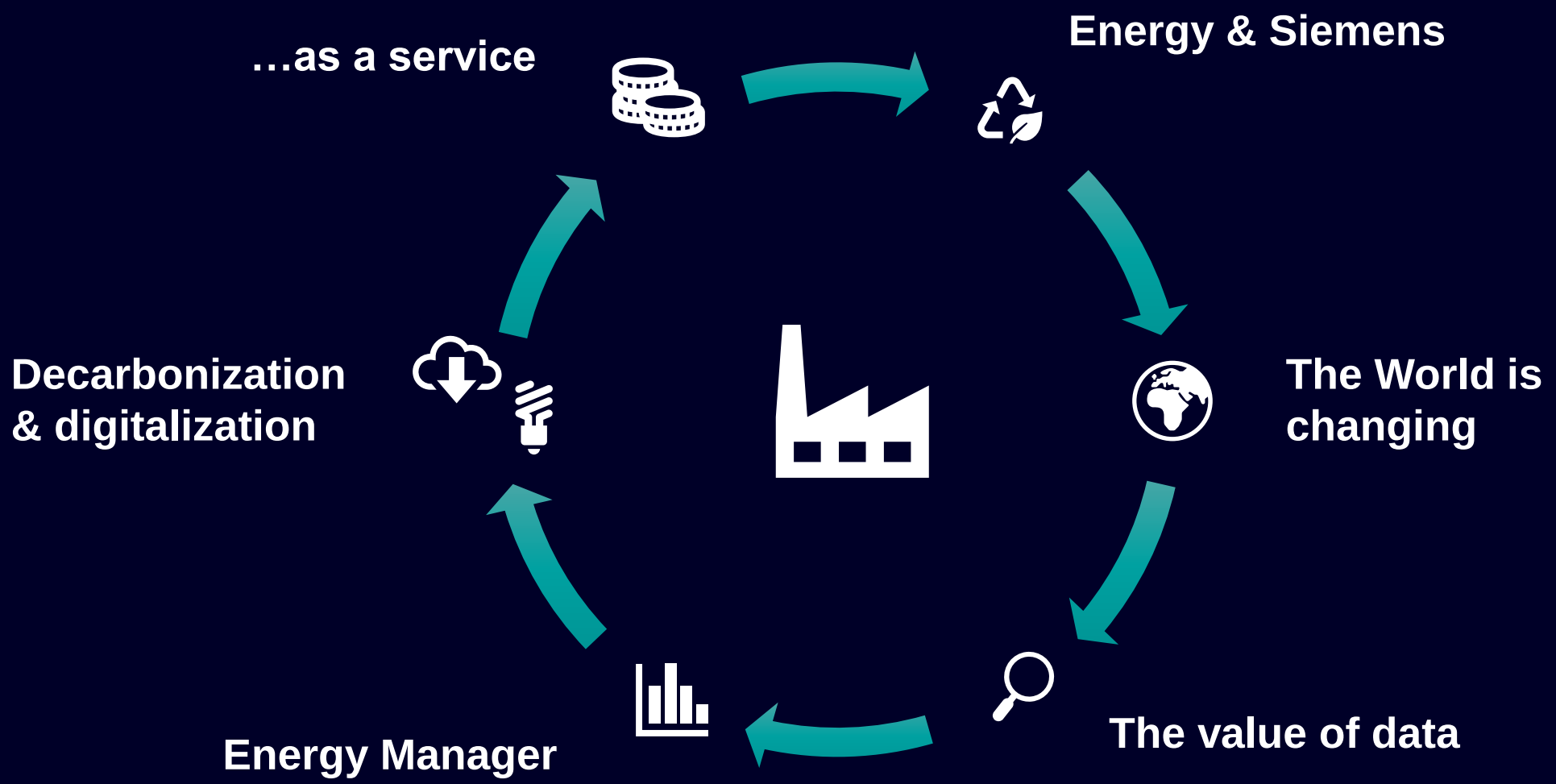
Pharma - value wheel



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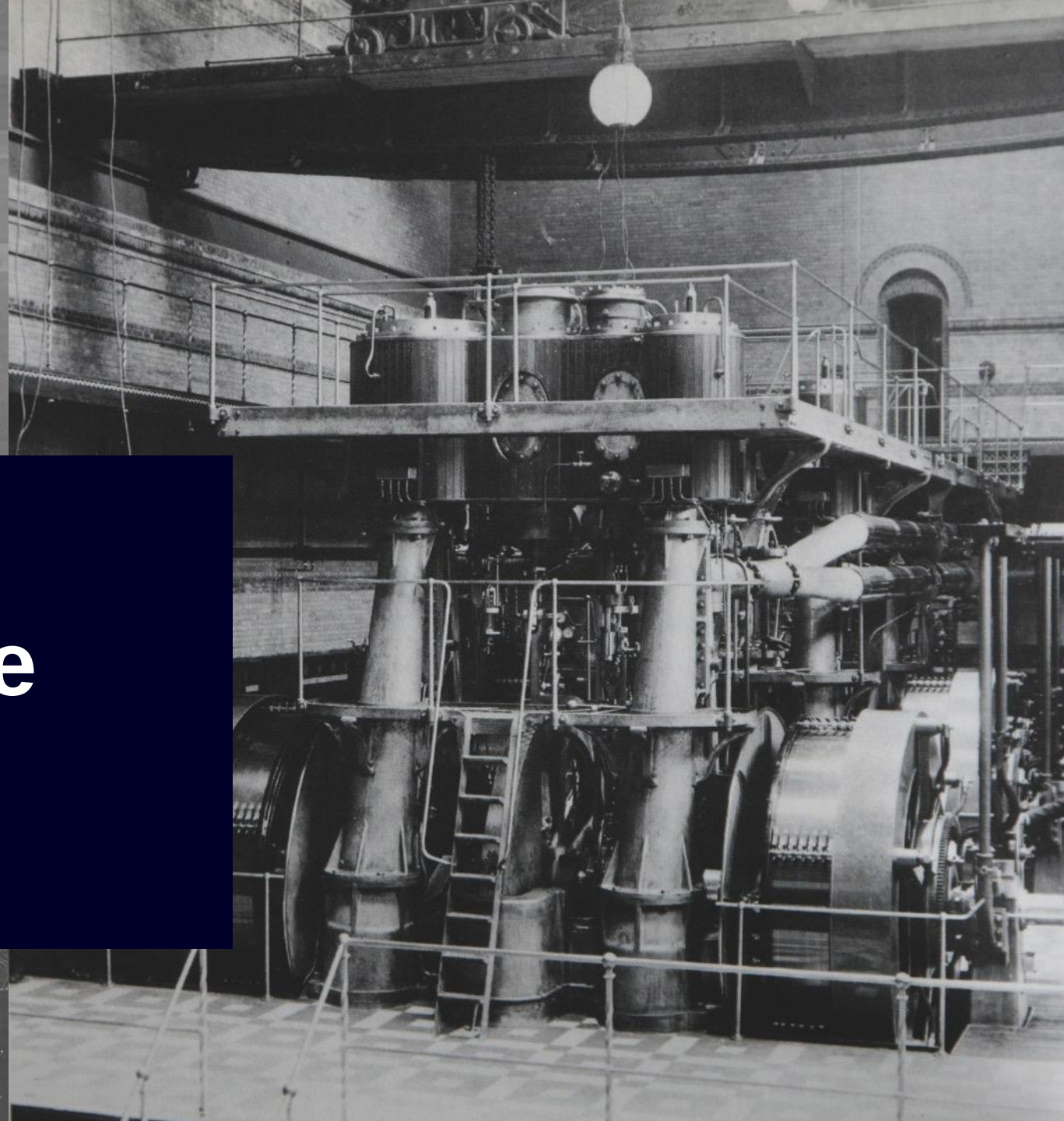
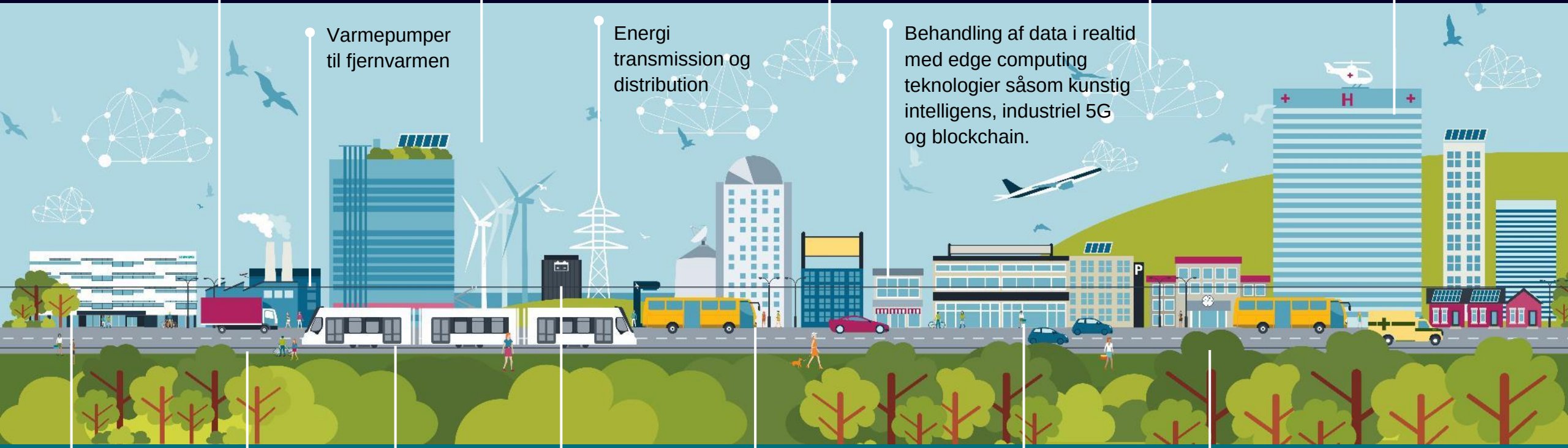
Leverandør til Københavns første elektricitetsværk (1892)



Danmarks største vindmøllepark indvies ved Anholt (2013)

Vi bidrager til at elektrificere, automatisere og digitalisere vores samfund



Industriel automatisering og ”drive” teknologi

Vindmøller og solenergi

Digitalisering og cloud løsninger (Industriel IoT)

Industriel sikkerhed og cyber-sikkerhed I kritisk infrastruktur

Sundheds-løsninger

Varmepumper til fjernvarmen

Energi transmission og distribution

Behandling af data i realtid med edge computing teknologier såsom kunstig intelligens, industriel 5G og blockchain.

Carbon Capture, Power-2-X etc. (pilot projekter)

eHighways

Letbaner, signalsyste-mer, Elektrificering

Energi-lagring

Ladeinfrastruktur for elektriske busser og biler

Intelligente bygninger

Energi-optimering af private og offentlige bygninger

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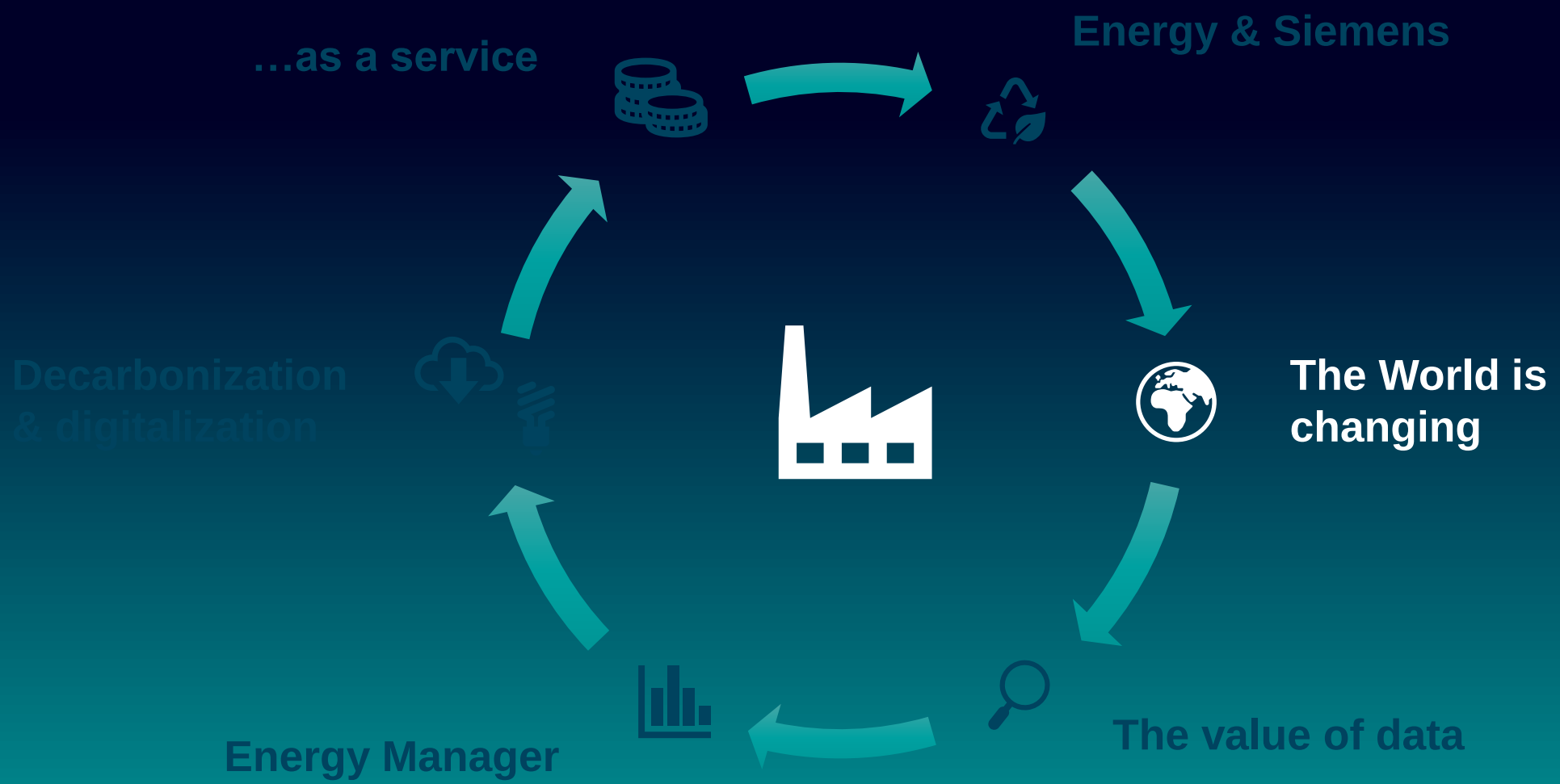
Pharma - value wheel



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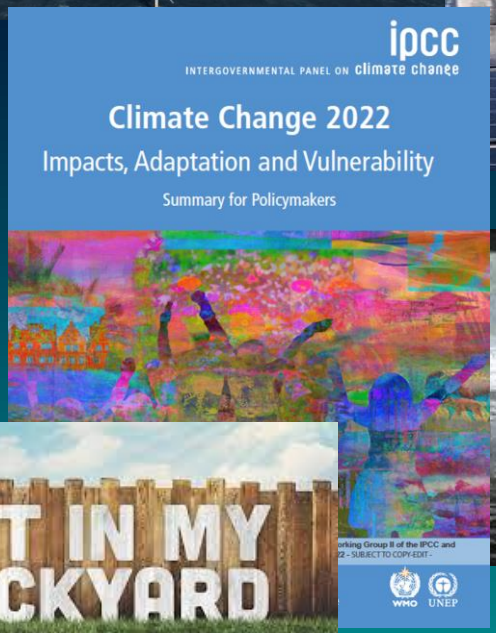
The world is changing…



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Science Based Targets initiative, SBTi

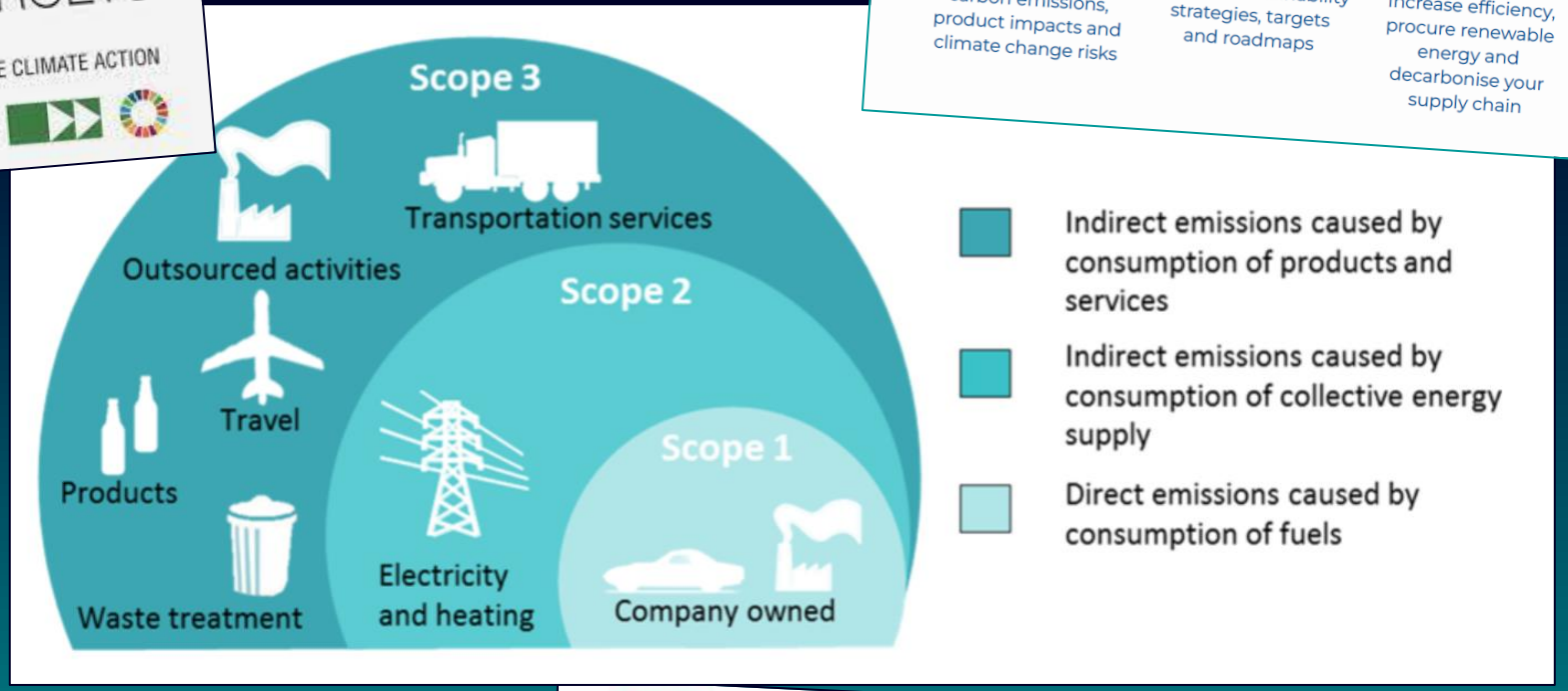
SCIENCE BASED TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

BUSINESS AMBITION FOR 1.5°C

The Climate Journey

Measure footprint & risks	Set roadmap & create targets	Reduce footprint	Finance climate action	Communicate & lead
Understand your carbon emissions, product impacts and climate change risks	Develop sustainability strategies, targets and roadmaps	Increase efficiency, procure renewable energy and decarbonise your supply chain	Finance climate action, e.g. through avoidance and removal of unavoidable emissions	Engage stakeholders in your sustainability vision and communicate the results



GREENHOUSE GAS PROTOCOL

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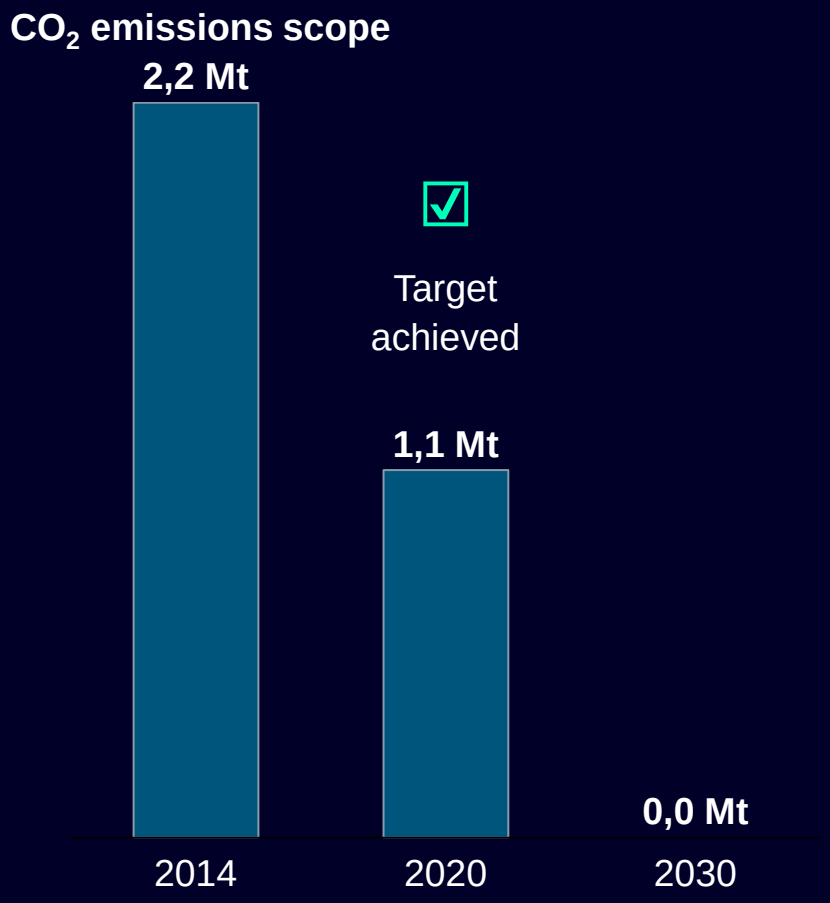
Siemens Decarbonization Program: We achieved our interim target to halve our CO_2 footprint by 2020 and are on track to become net zero by 2030



1 **We reduced our CO_2 emissions by >50%** via energy efficient buildings & factories, green electricity, decentralized energy systems, new mobility concepts & eCars, reduction of SF6 gas

2 **>70% of the electricity consumption of our sites globally is covered by renewables**

3 **Our investments in energy efficiency projects led to 15% reduced energy costs**

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Decarbonization
support the 1.5°C target to fight global warming

Major achievements

- Early commitment in 2015: 1st major industrial company to commit to net zero in its own operations 2030; 54% CO_2 reduction by 2020 (fleet, decentralized energy systems, green energy sourcing, CO_2-neutral buildings)
- Abatement of ~ 88 million tons p.a.[1] of CO_2 emissions through our portfolio at our customers
- Strong offering of decarbonization solutions

Ambitions and further commitments

- 1.5 °C SBTi[2] commitment and “triple joiner” for EP100, EV100, RE100[3]
- Net zero operations by 2030 in line with SBTi pathway
- Net zero supply chain by 2050, 20% emissions reduction by 2030

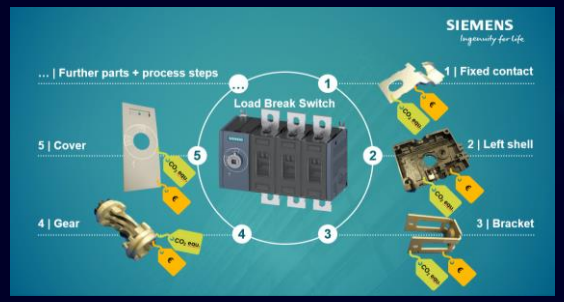
SCIENCE BASED TARGETS DRIVING AMBITIOUS CORPORATE CLIMATE ACTION · CLIMATE GROUP EP100 · CLIMATE GROUP EV100 · RE100 CLIMATE GROUP · CDP

1 FY 2020 **2** SBTi: Science Based Targets initiative **3** Commitments on Energy Productivity improvements (EP), use of Electric Vehicles (EV), and Renewable Energy (RE)

Selected highlights

Energy performance contracting to reduce emissions and costs

Microgrids for Siemens, e.g. in Vienna, Milan, Midrand



Green Digital Twin drives sustainable design and sourcing decisions

Carbon reduction at suppliers

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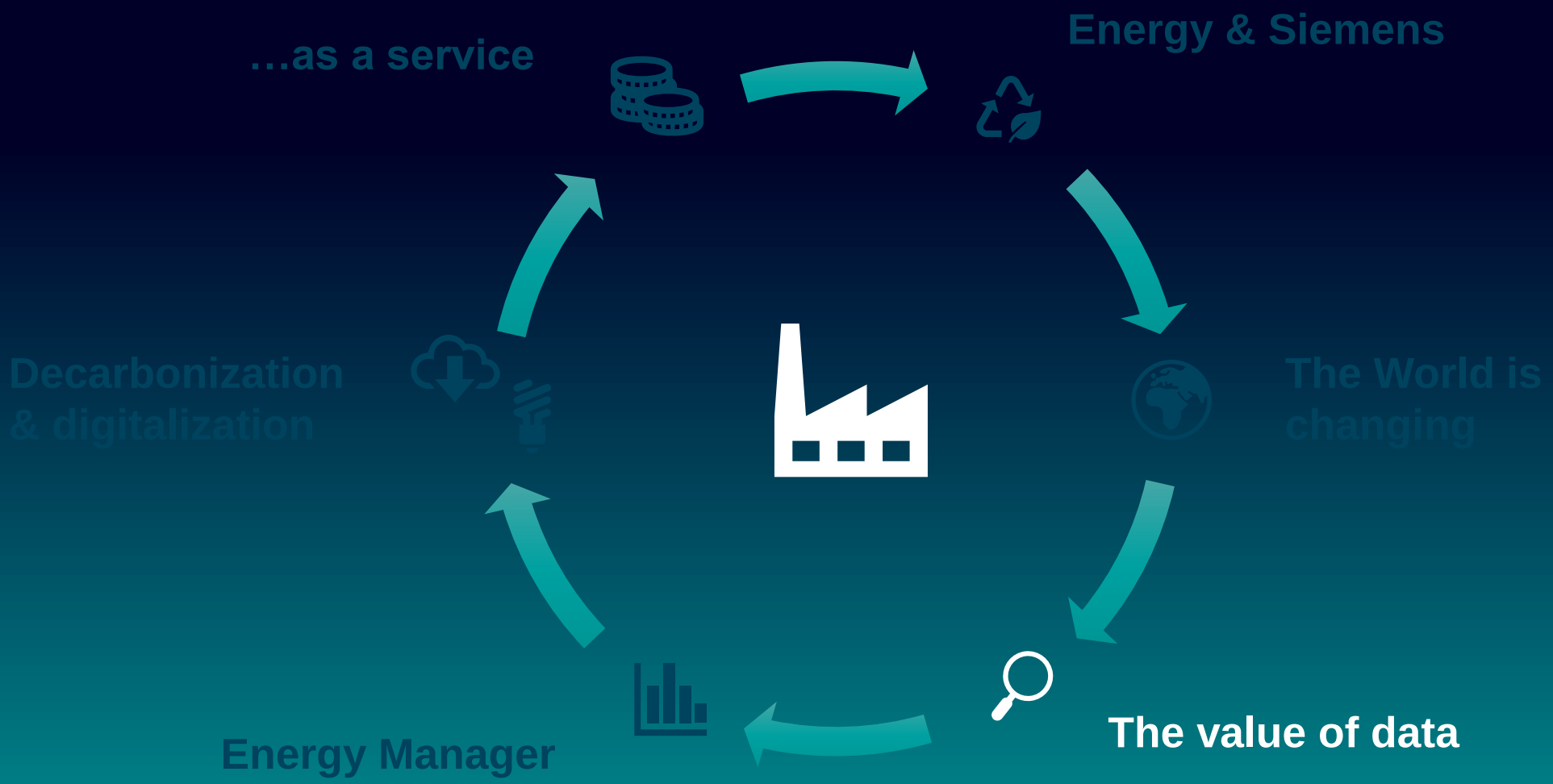
Pharma - value wheel



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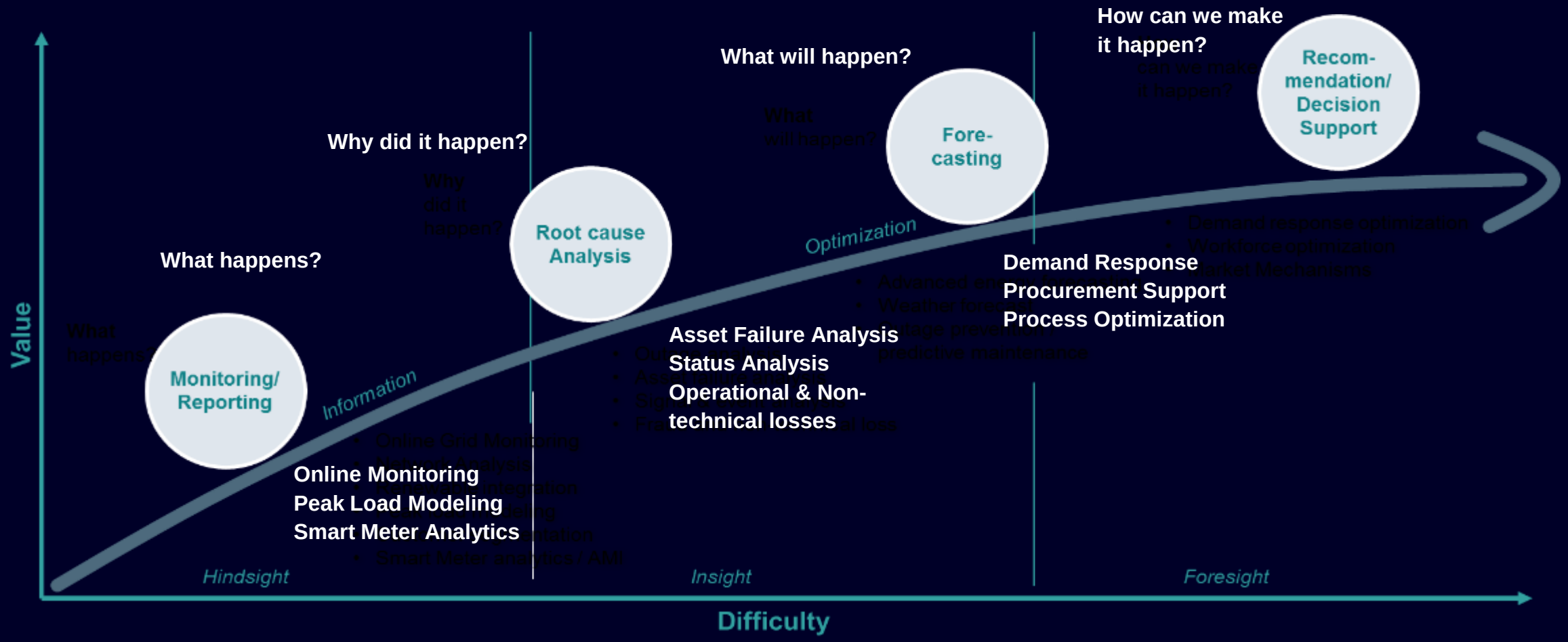
How to Start Energy Management?
The Value of Data…



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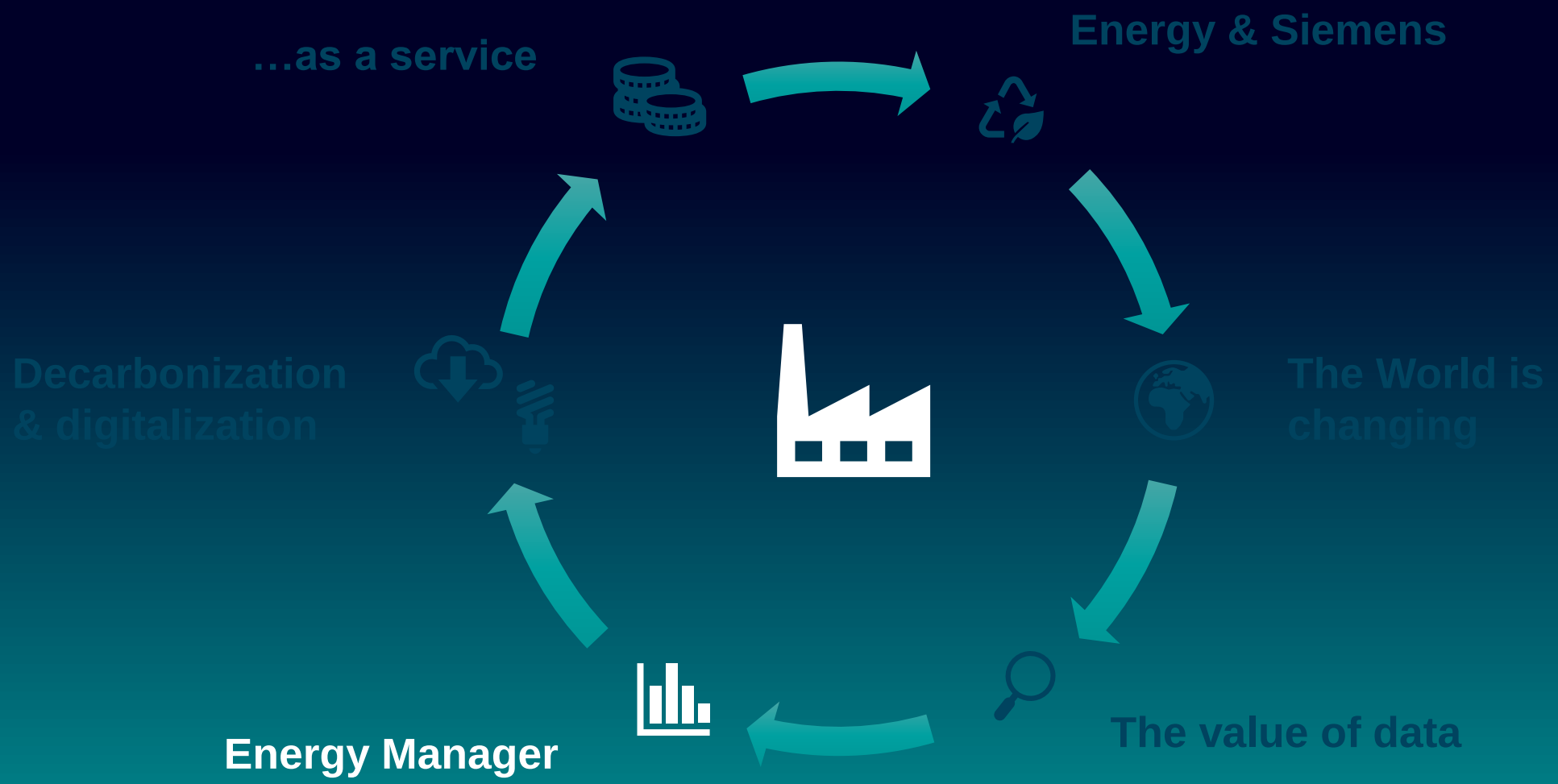
Pharma - value wheel



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Upcoming and rising challenges in Industrial Energy Management

Fulfilling legal requirements

Increasing grid stability

Cutting energy costs

Increasing
energy efficiency

Reduce carbon footprint

Optimized use of resources

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Main features in Energy Management SW

Invoice verification
Trust but verify

Mapping of complex tariff models
Configuration of complex tariff models

Batch Analyses
Energy Data analysis on batch.
Product or equipment level

Comprehensive reporting
Automatic reporting

Energy accounting
Cost center accounting

Data quality
Data monitoring and alarming

Energy controlling
Strong and flexible toolbox

User involvement
User customized data presentation

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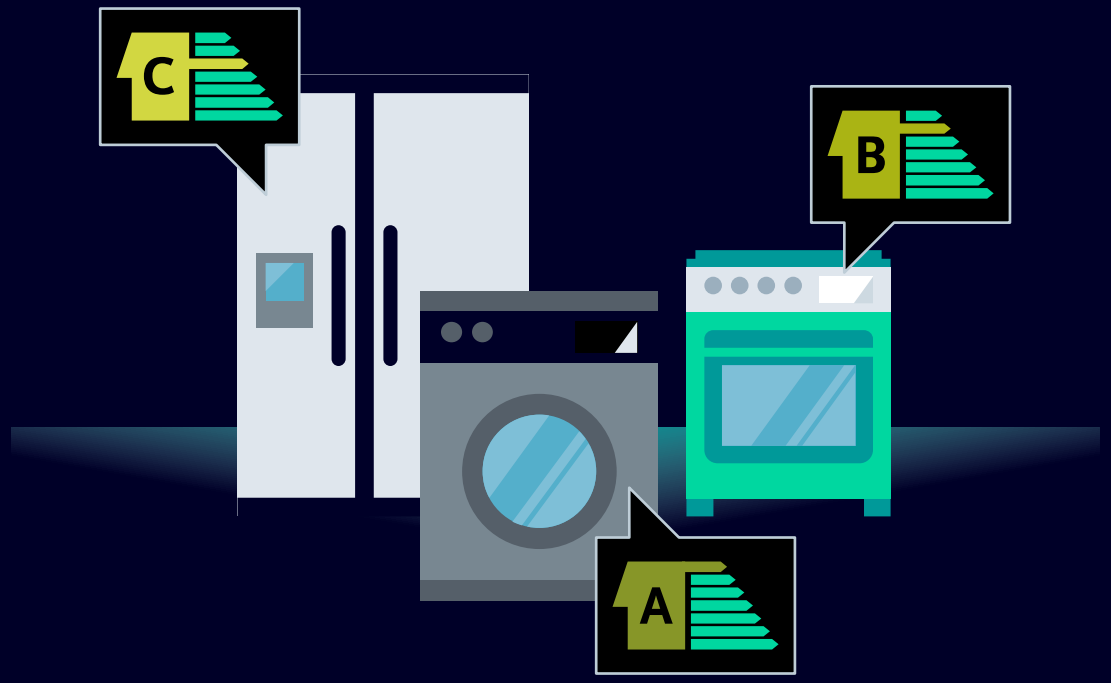
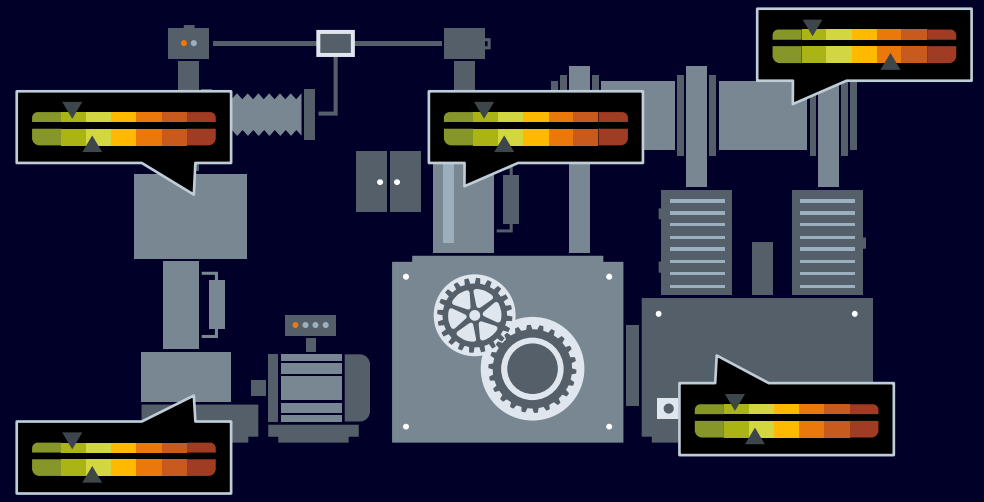
How to enable machines in brown field & green field to improve energy efficiency?

How can the energy efficiency of machines be compared at all?

The evaluation of the efficiency of household appliances has already been standardized



How can the efficiency of industrial machines be compared?



SIMATIC S7 Energy Efficiency-Monitor

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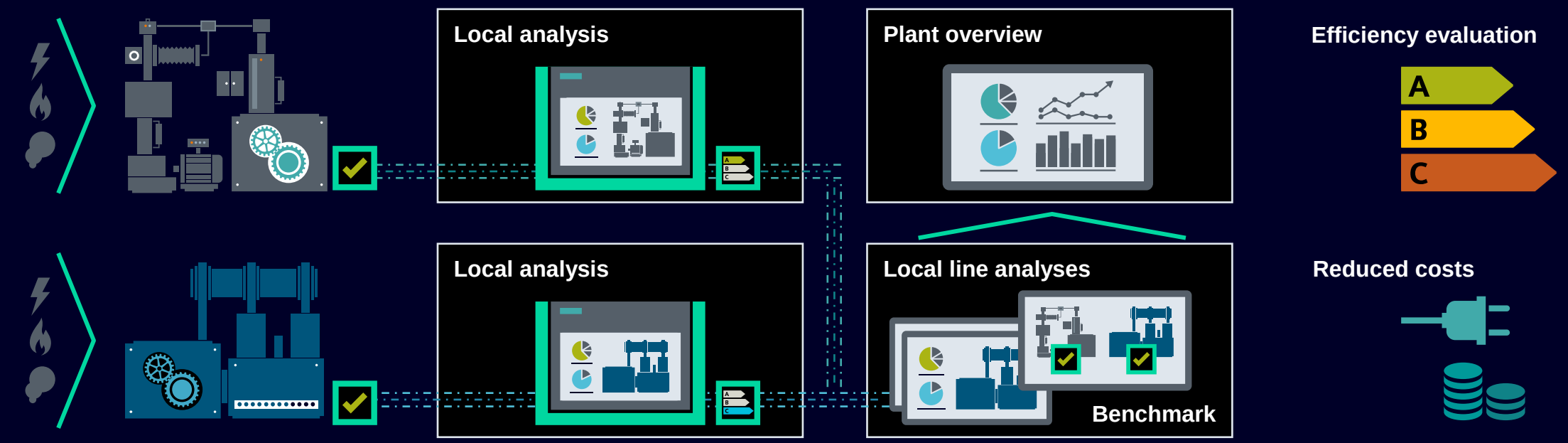
The standardized path to increased energy efficiency in production: From procurement to operation

Standardization
Uniform energy benchmarks

Procurement
Energy acceptance form for comparison purposes

Operation
Continuous monitoring (energy per mode, for all sorts of energy)

Optimization
Analysis and evaluation
Optimization measures



Vendor independent concept according to measuring specification VDMA 34179

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Analytics across all levels creates higher overall efficiency

MindSphere

Plant

… to increase
overall energy efficiency
… for everyone
and everywhere

Line

Aggregate the data
at line level
… to review line efficiency

Machine

Collecting data from all machines –
energy & machine as a standard
Contextualize energy & production
data

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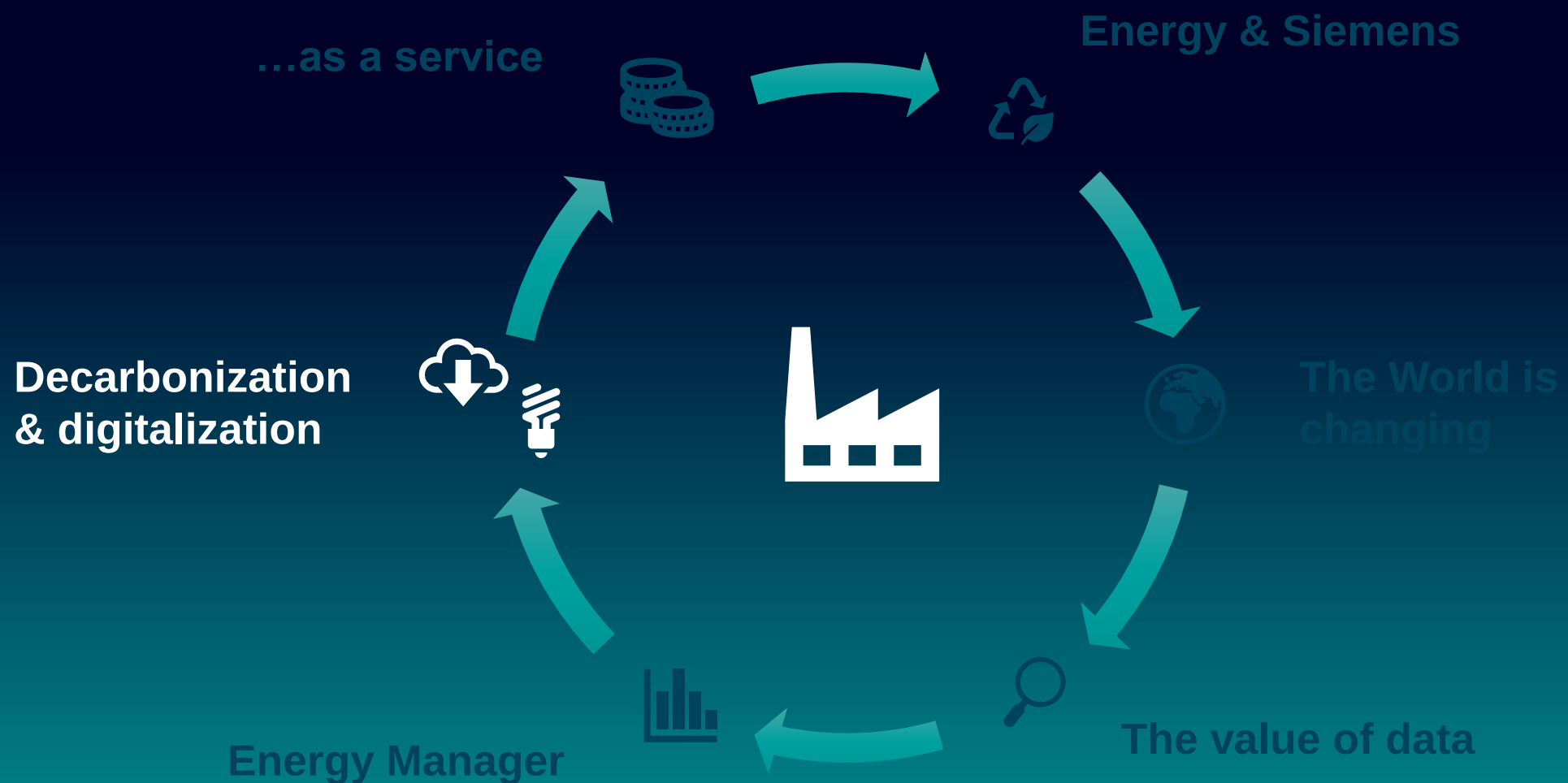
Pharma - value wheel



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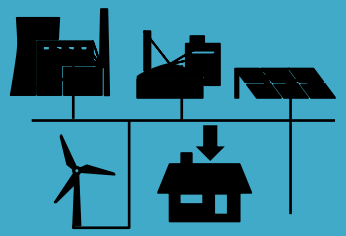
Siemens Approach within the Pharma vertical –
Holistic Services for Energy Management, Energy Efficiency & Sustainability

Energy Management

Supply Side Optimization

Generation, Storage & Distributed Energy



Demand Side Optimization

Building and Asset Performance

Data Transparency & Analytics

Flexible Business Models

Global Program Management

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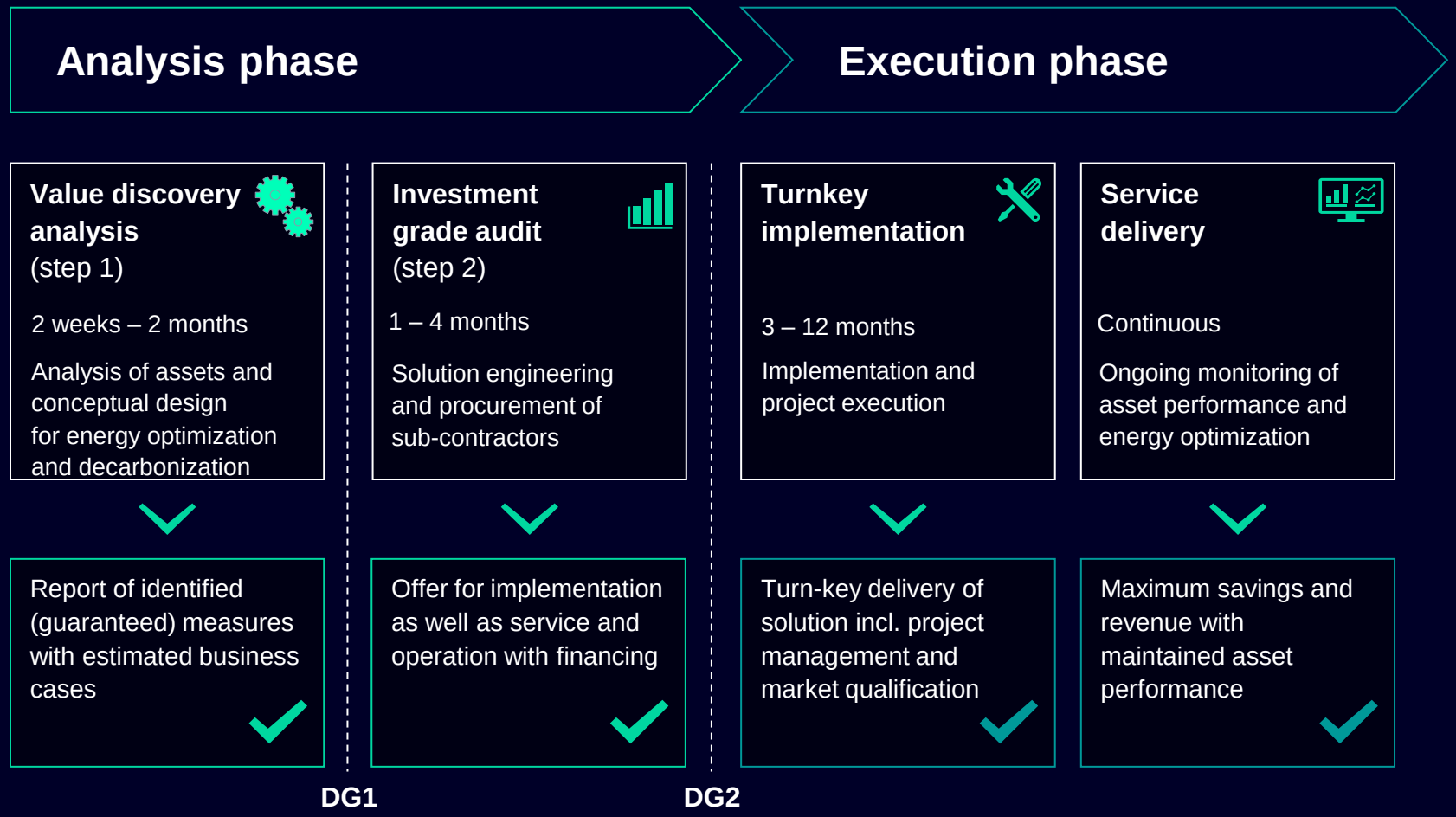
Siemens project development process for implementation of energy efficiency



Key deliverables

- Guaranteed business case
  (no risk on energy savings and investment)
- Quick but comprehensive overview of opportunities for optimization
- Future proof of technical installations and risk mitigation via comprehensive digitalization
- Transparent step-wise process with option to step out at any time
- No impact on CAPEX or balance sheet with Energy Efficiency as-a-service
  (off-balance solution must be approved by the costumers accountant
- Single point of contact

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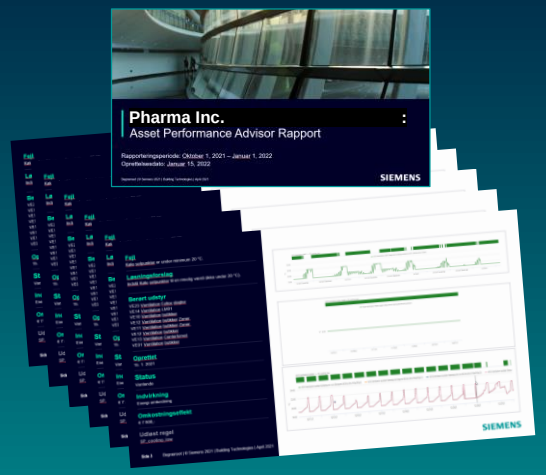
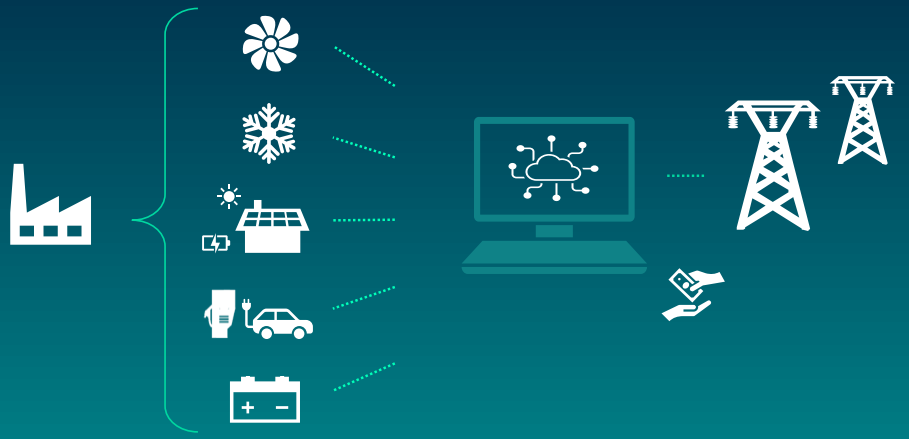
Digitalization - two touch points

Asset performance advisory



Ancillary services to the grid



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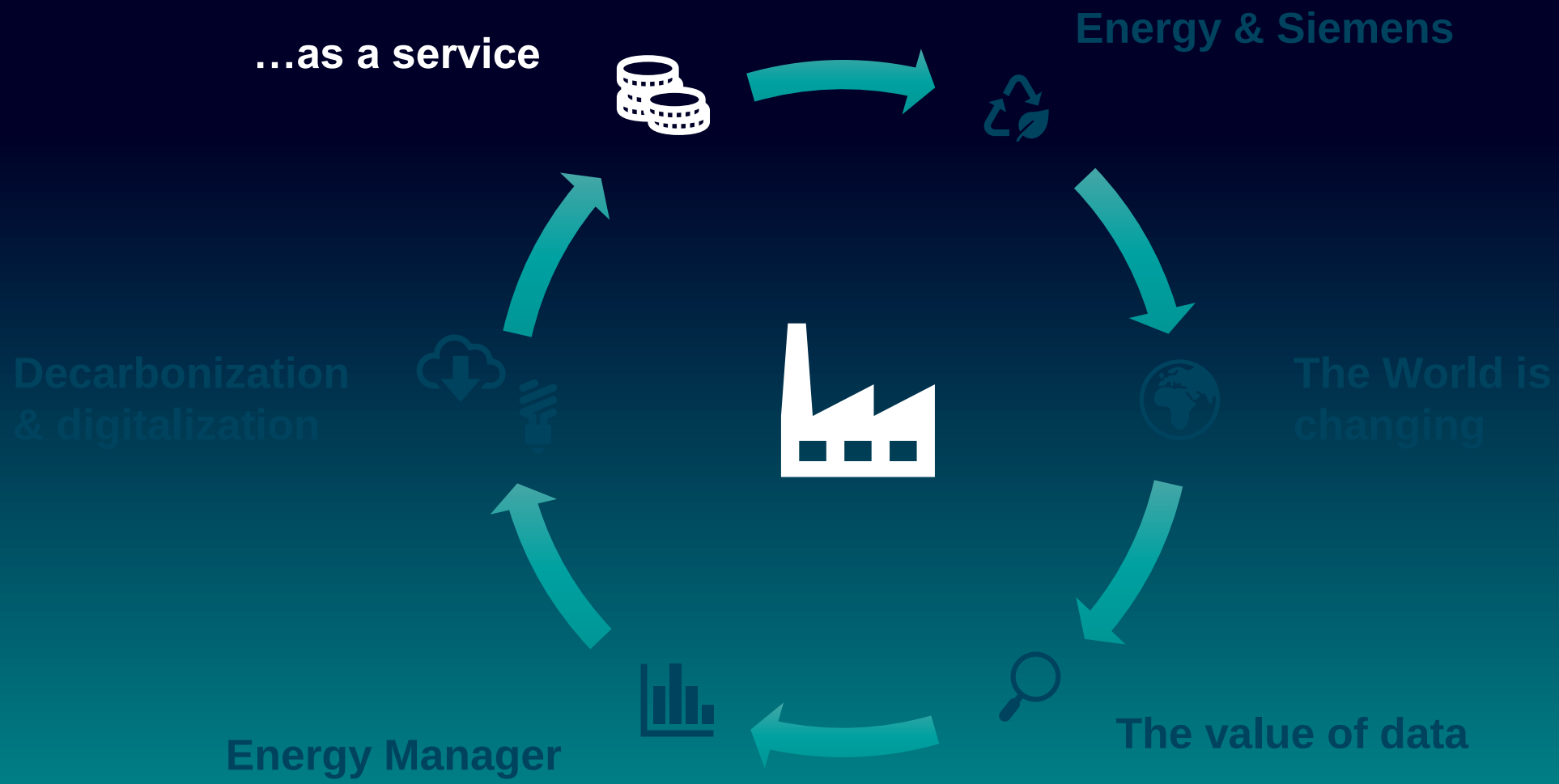
Pharma - value wheel



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Delivery Models – Analogy to a well known case …

Buy/own a car

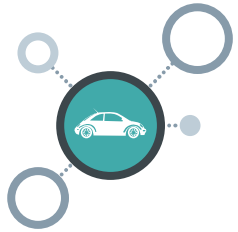
- Large upfront investment
- O&M at owner's responsibility

Traditional financing

- Monthly fees
- O&M at owner's responsibility

Mobility as a Service

- No upfront costs – "pay per use"
- No transfer of ownership
- O&M included in service fee



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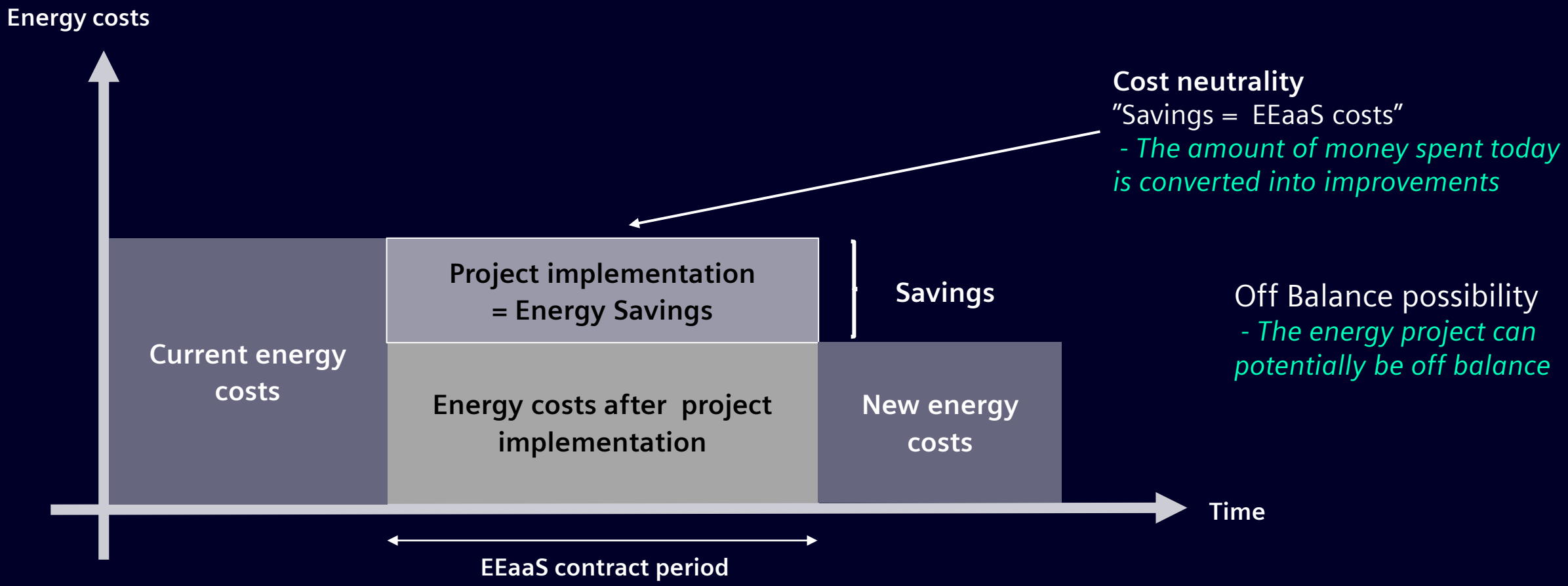
How does EEaaS work?

- Energy costs are converted into energy improvements…



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Contact

Thomas Brændgaard Nielsen
Sales Executive & Business Development
Mobile: +45 60 13 52 45
E-mail: thomas.braendgaard@siemens.com

Erik Madsen
Technical Account Manager
Mobile: +45 21 78 47 18
E-mail: erik.madsen@siemens.com

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