Twin Transformation, Power & Utilities

Dr. Sam Mokhtari

About me

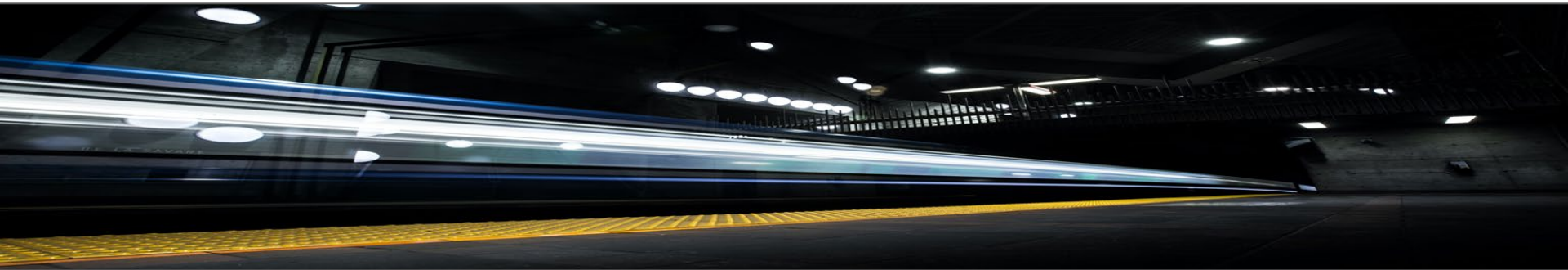
My career journey commenced with receiving a Ph.D. from QUT in 2014. Upon graduating from QUT, I worked as a postdoc fellow at CSIRO, dedicating my expertise to crafting innovative AI-powered solutions benefitting elderly individuals striving for secure and independent lives within their smart homes. Before joining AWS, I was at Deloitte as a specialist lead, taking charge of the execution of large-scale implementation projects centered around harnessing the potential of emerging digital technologies, such as cloud computing, Internet of Things (IoT), advanced analytics, and artificial intelligence (AI).

Disclaimer

Agenda

- Key trends & challenges
- Key capabilities required for power & utilities
- Digital transformation elements
- Sustainability transformation elements
- Take-aways

Key Trends



P&U Industry Definition and Size

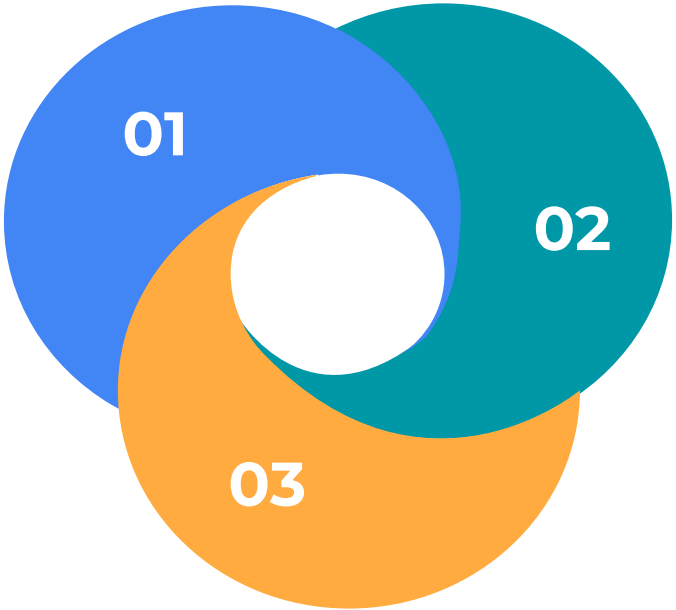
The Power & Utilities (P&U) industry encompasses the **production, marketing, transmission, distribution, retailing and management of electricity, gas and water**, as well as the suppliers and consultants to the Utility market.

Source: Businesswire

Role of DER

We have all these distributed energy resources which are integrated to the grid.

The big question is to what extent utilities, third parties, and customers can manage this DER digital infrastructure cost-effectively.



A new digital infrastructure is required to aggregate and manage these resources.

The urgency for environmental sustainability

IPCC: "Now or Never" on 1.5°C warming limit

Source: https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/

Electrification of Transportation

- Charging infrastructure is expected to experience unprecedented growth.
- This opens a significant opportunity for utilities to grow earnings.

New Players

01 This trend is expected to continue in the longer term.

02 Oil companies are investing in the power industry.

03 Oil company investments in storage technologies, transport electrification, and renewable energy have increased noticeably over the past several years.

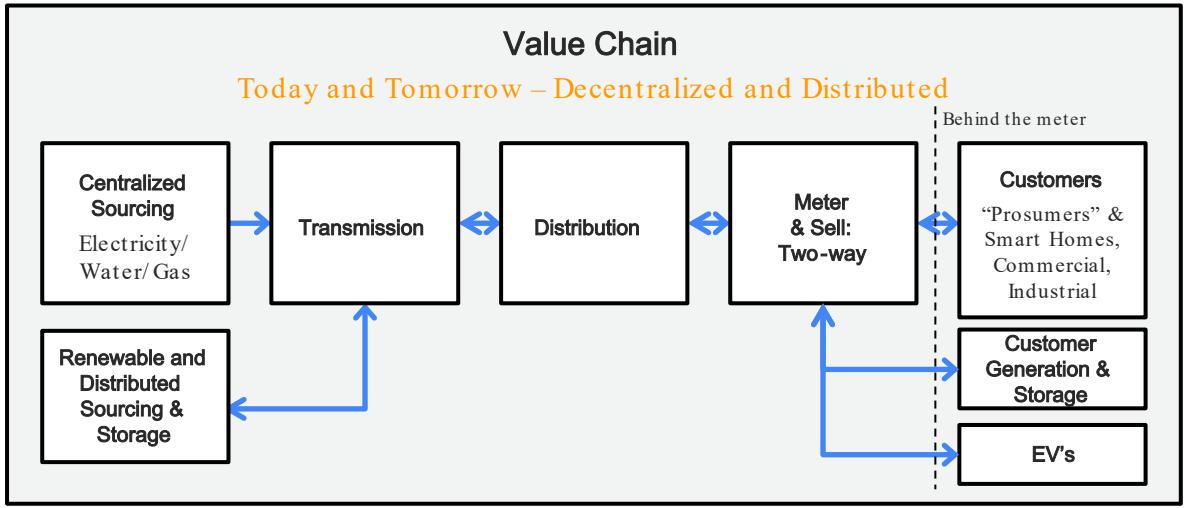
4D's & the changing value chain

Decarbonization
Meeting sustainability goals, less fossil more RE…

Decentralization
Lower barriers to entry, more DERs & grid complexity, DERMS, VPP…

Digitization
To meet raising customer expectations and data needs while reducing cost to serve

Plus, **Deregulation** ; the known, but unspoken D

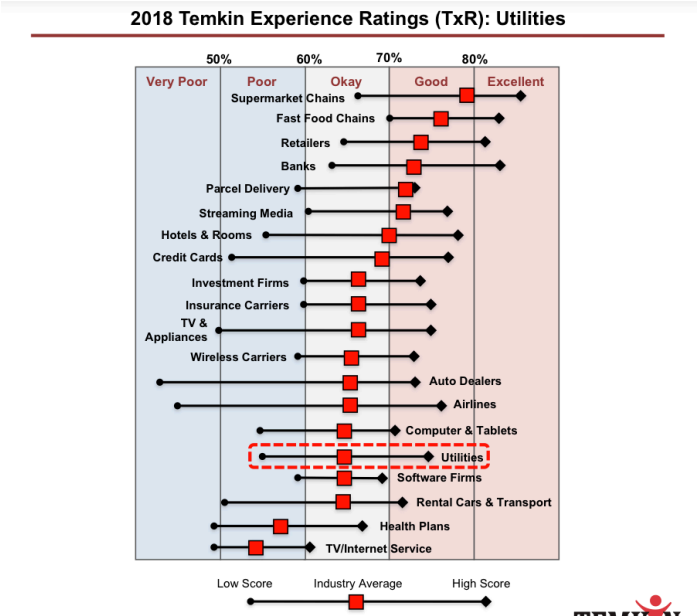


Disaster Readiness

- Utilities and other players may increasingly deploy digital tools to address issues such as the recent pandemic and extreme weather events.
- The first set of solutions revolves around a remote workforce, while the second set of digital solutions pertains to a remote workplace.

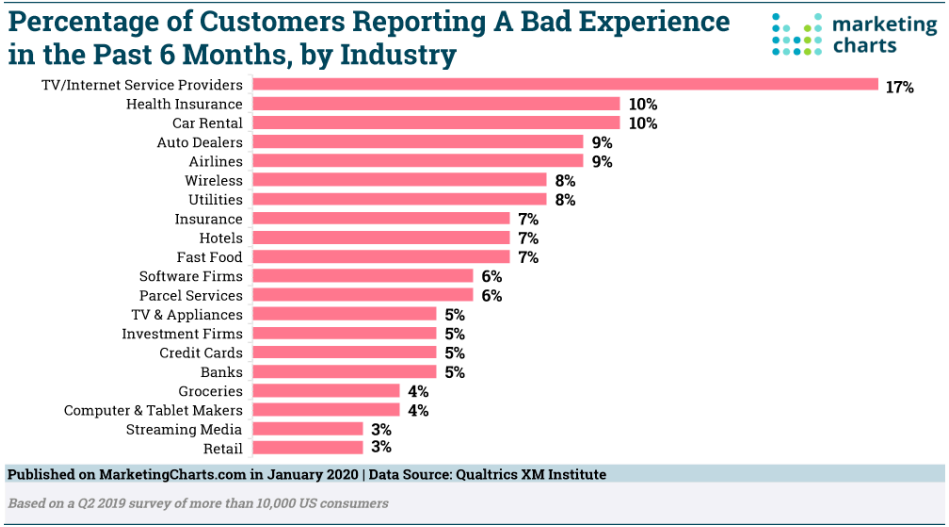
Bending the O&M curve downward

Utilities Falls Far Behind other Industries – which are Setting Customer's Expectations

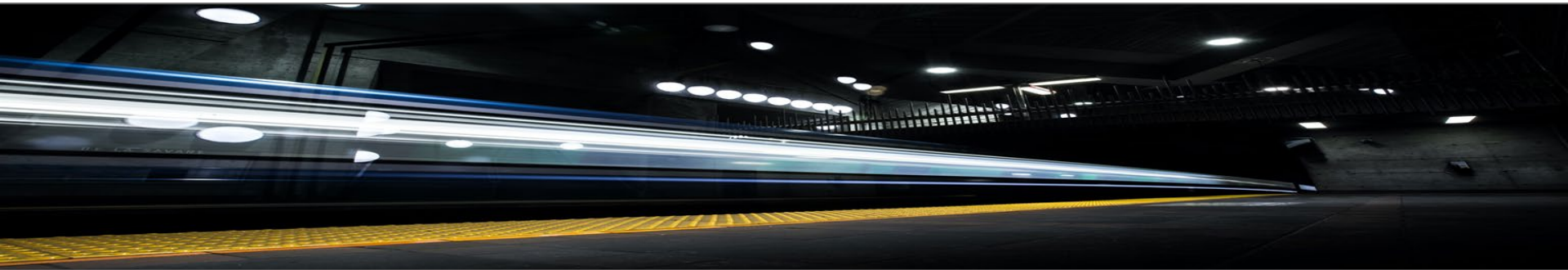


Base: 10,000 U.S. consumers
Source: Temkin Group Q1 2018 Consumer Benchmark Study

TEMKIN GROUP
When experience matters



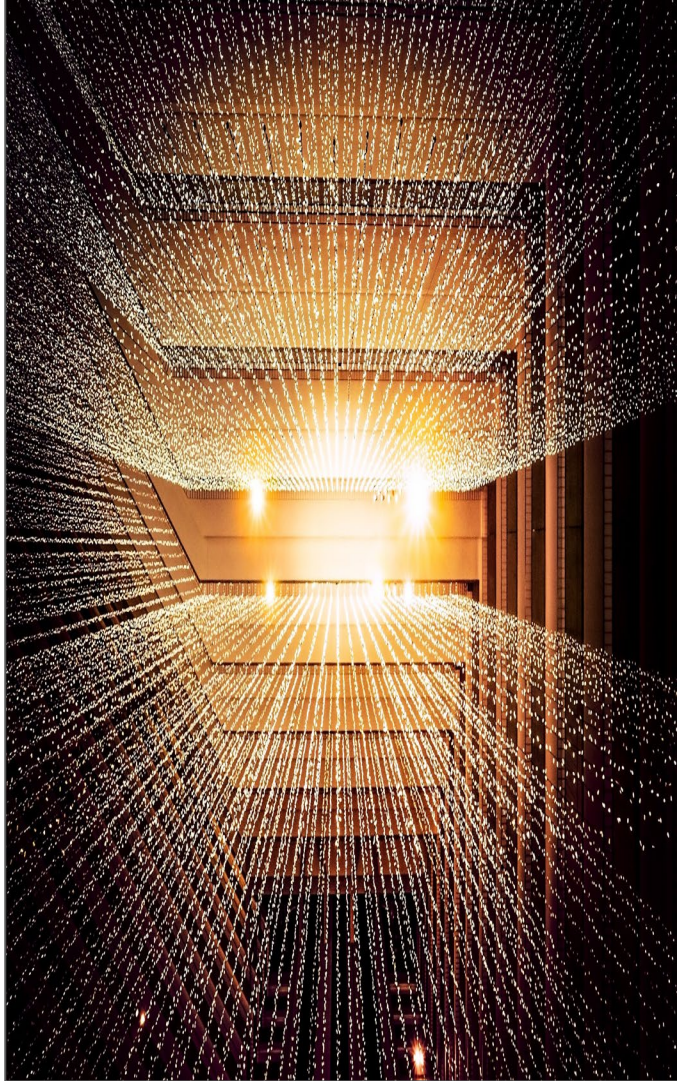
Now what?



Digital and sustainable technologies are the key enablers for Power Sector to address the top priorities & challenges

Powered by these twin engines of growth, they're
2.5x more likely to outperform their peers.

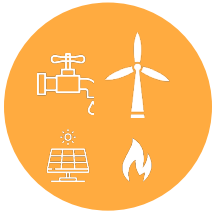
-Accenture, April 2021



What is Digital Transformation?

Using digital Technologies to create new or modify existing products, services and operations.

Digital Transformation enables flexibility

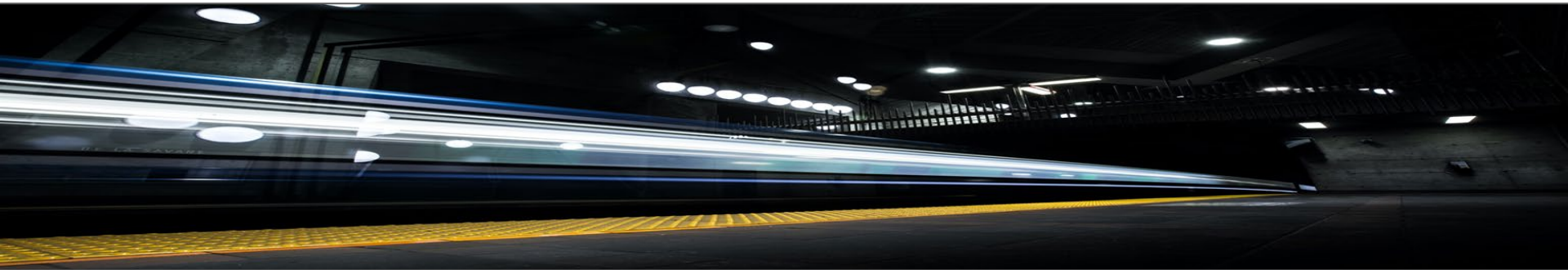


Flexible
Generation

Flexible
Delivery

Flexible
Demand

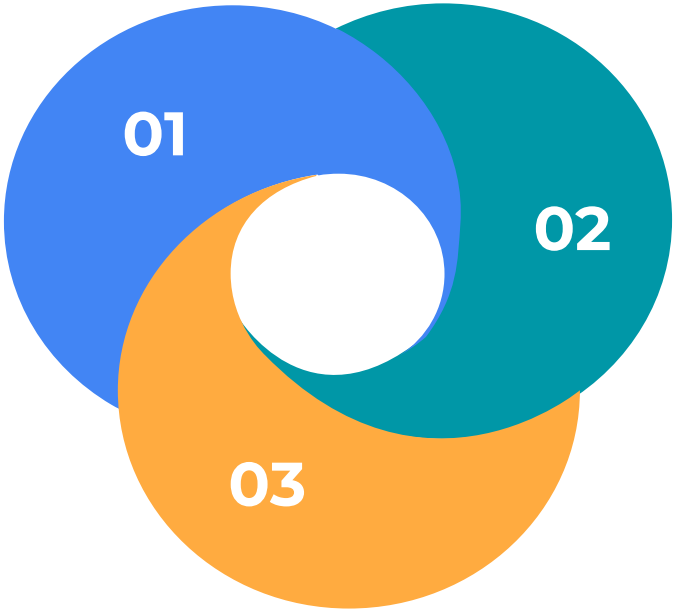
What is needed?



Modern technology

Traditional infrastructure is not enough to address industry trends.

Modernization efforts must align with industry trends.



Investment in modernization is necessary.

Modern Data Management

- Data and analytics can enable DER aggregation and disaster readiness.
- Energy sector should see data as an asset.
- Investment in data management technologies is necessary.

Becoming Customer Obsessed

01 Power sector players should become more customer obsessed.

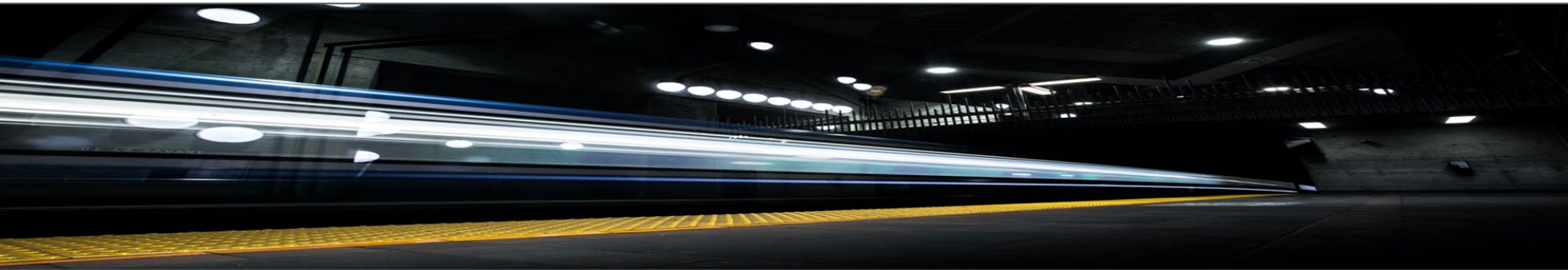
02 Customer engagement is lacking in the energy value chain.

03 Lack of customer engagement removes opportunities for utilities and network operators.

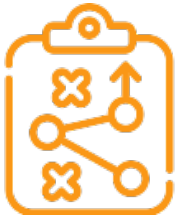
Culture of Innovation

- Adopting innovative culture is necessary to deal with industry trends.
- Innovative culture must be embraced by enterprises and businesses in the industry.

How to approach digital transformation?

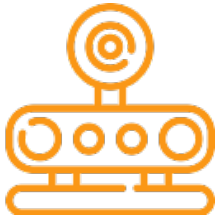


Dimensions of Digital transformation



Strategy

Data & analytics



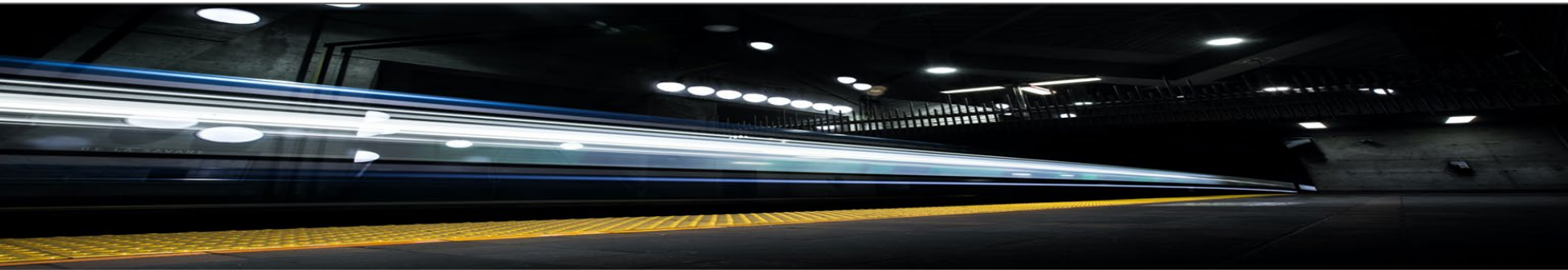
IT/OT

Customer Engagement

Talent

Regulations

Strategy



Strategy with Hybrid Digital Ambition

Overall Sector ambitions

Decarbonization | Decentralization | Deregulation | Digitalization

Digitalization Ambition

Optimizing current business model
e.g. Optimize operation
Improve customer experience

Transforming business model
e.g. New energy exchange model
The role of DER

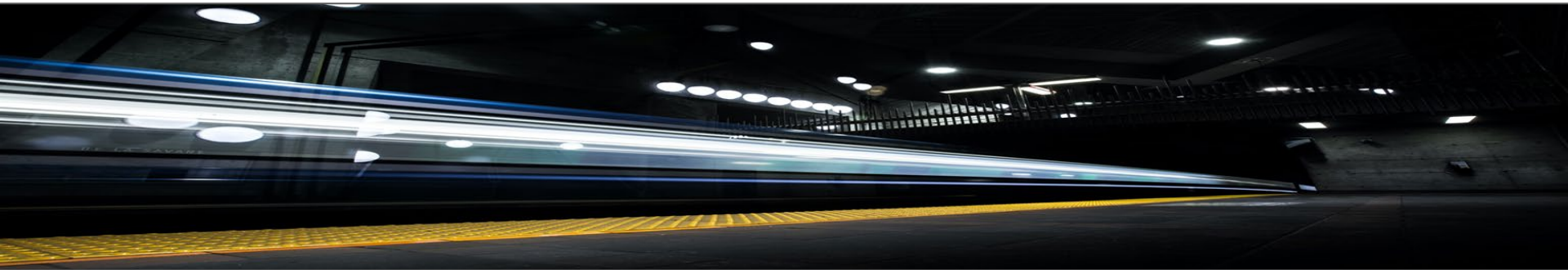
Hybrid Business models for Future of Power Sector

Value Chain

Platform

Decentralized

Data & analytics

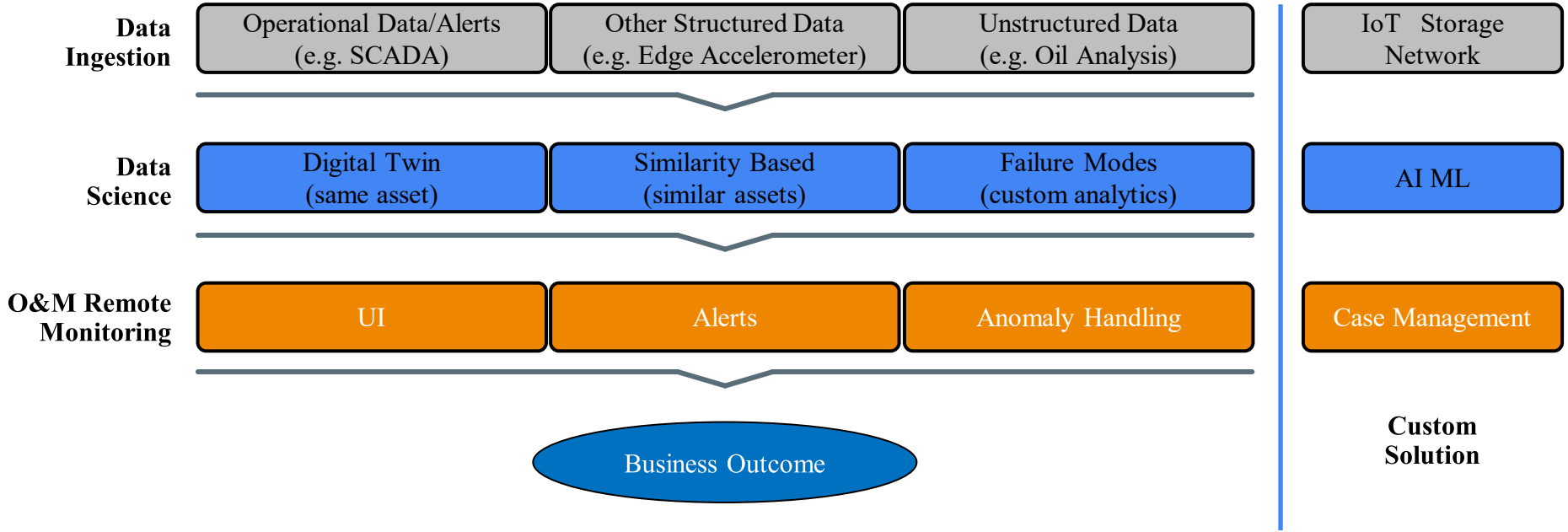


Analytics use cases along the value chain

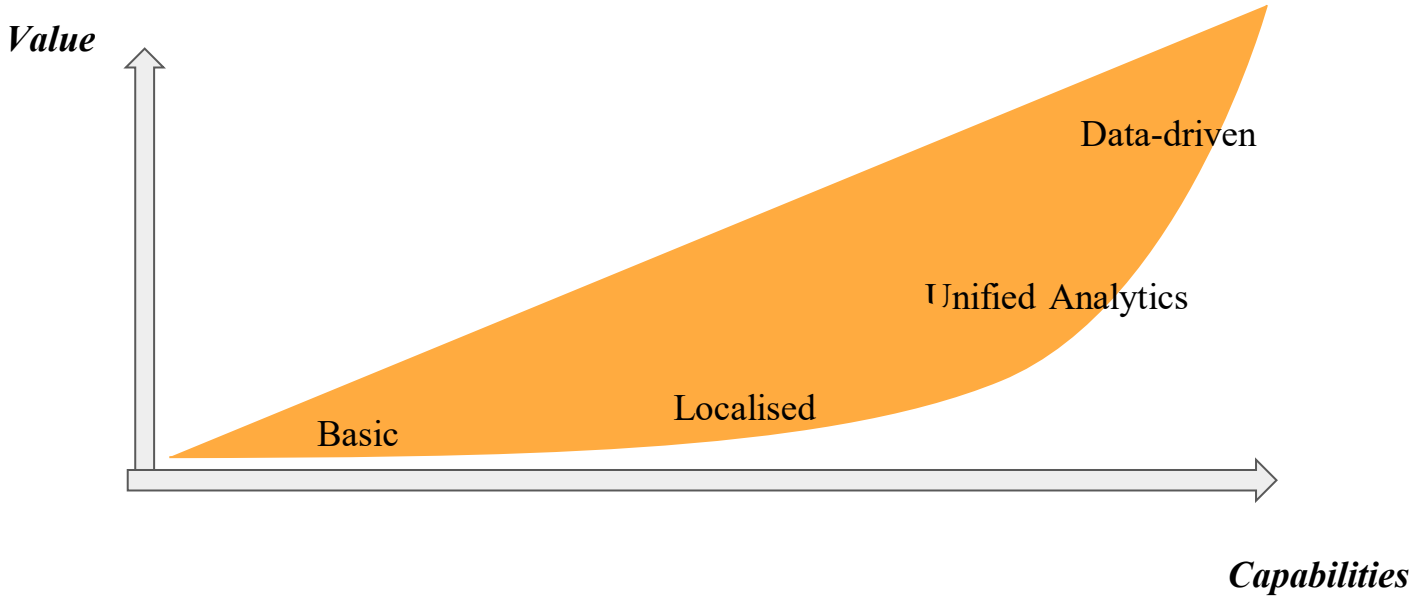
Generation	Transmission	Distribution	Consumption
• Supply-demand matching • DER management • Heat rate opt.	• Grid planning • DER integration • Route analytics • Outage management • Predicative maintenance • Outage management		• Demand response • Health & safety • Customer churn

Predictive Maintenance Use case

From Data Ingestion to Data Consumption



Analytics Maturity Model



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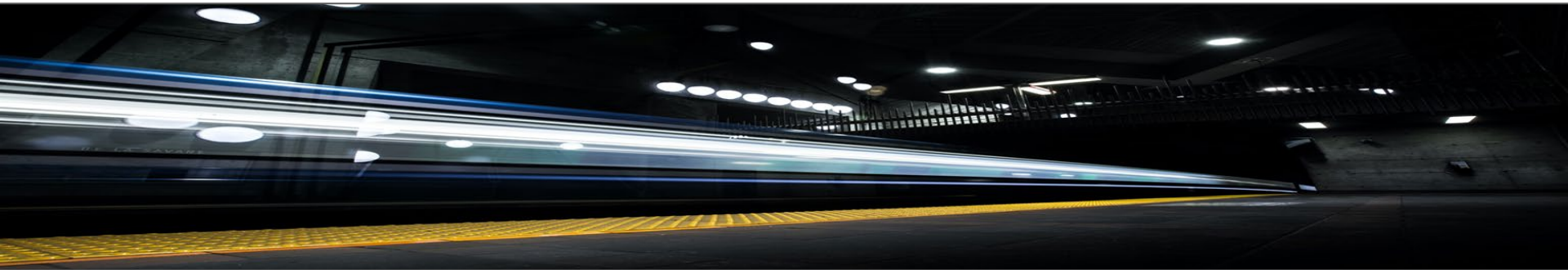

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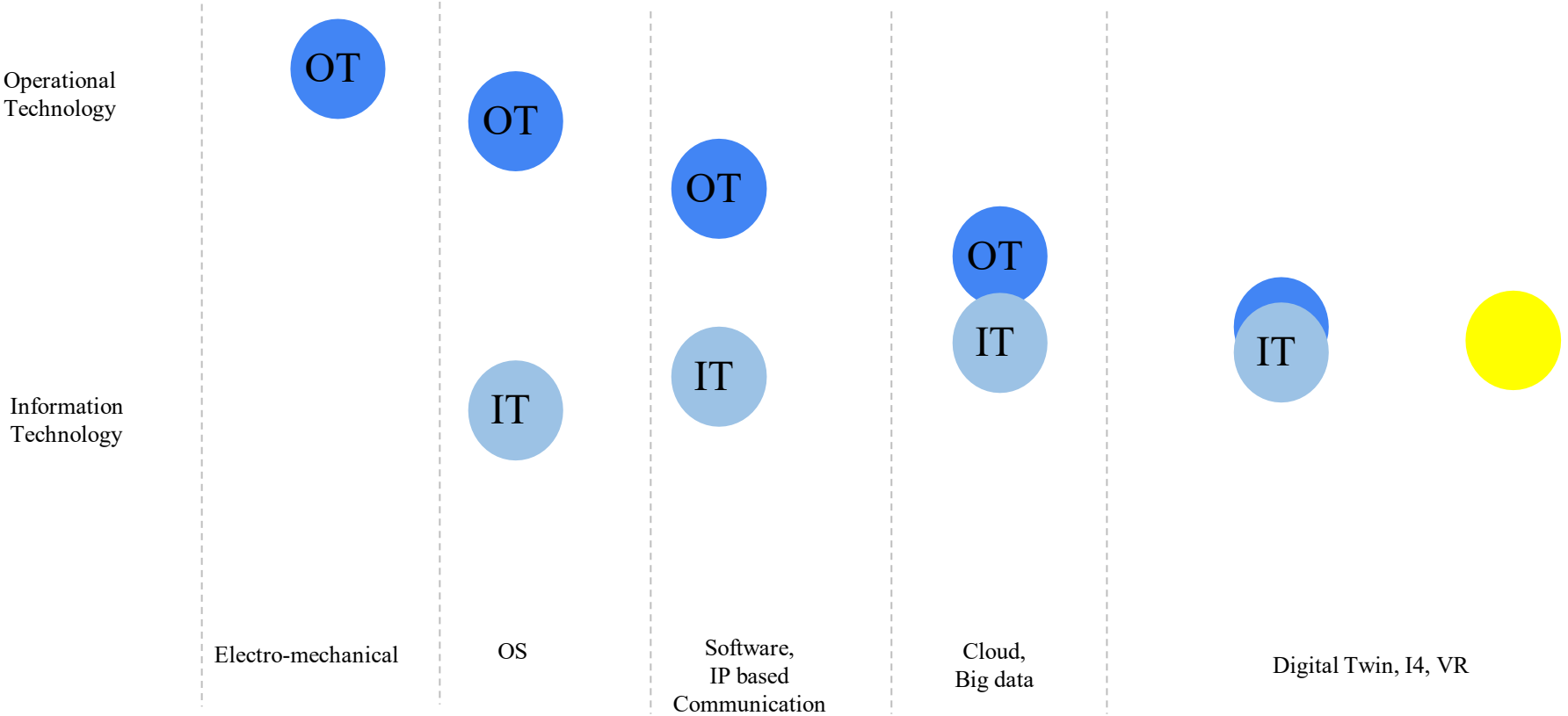
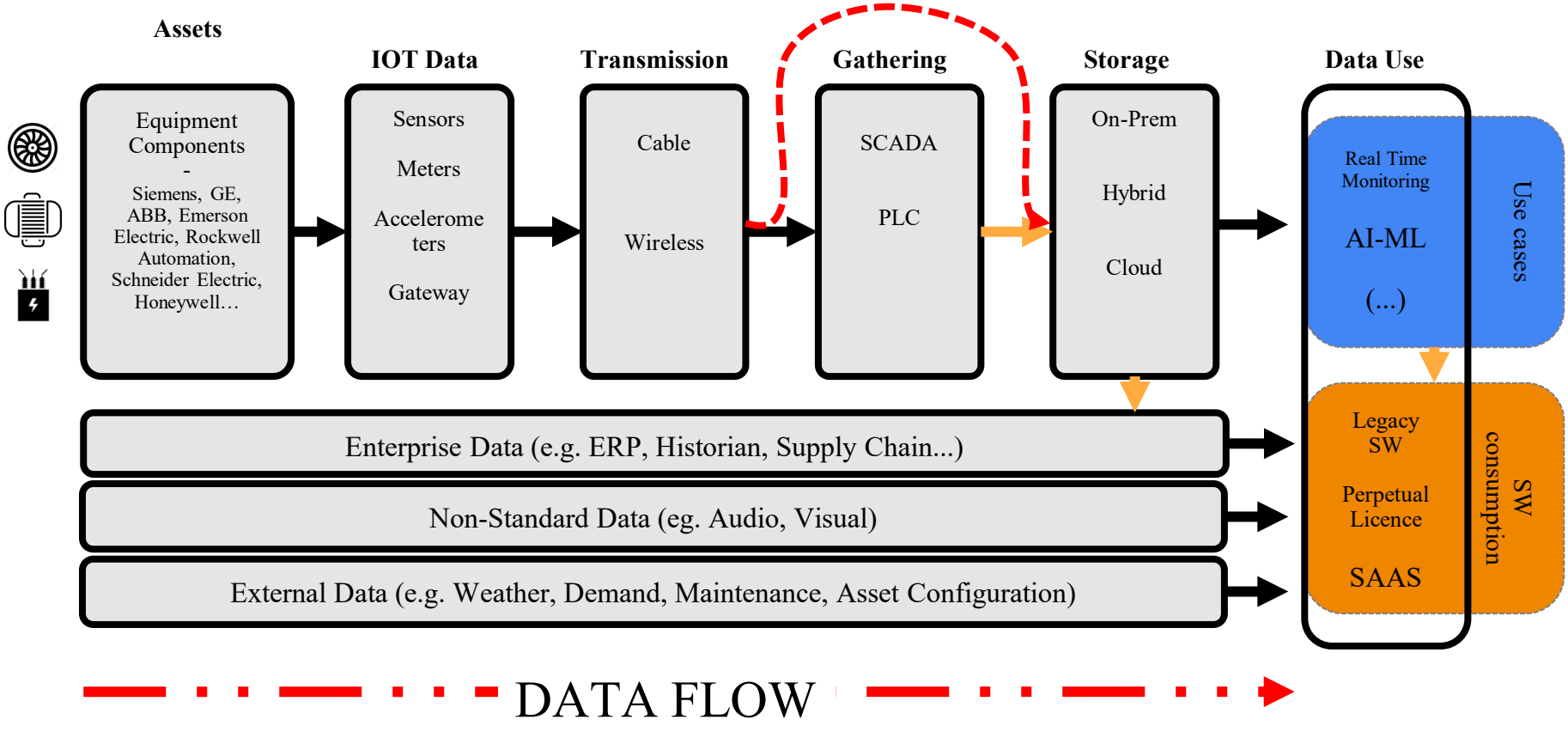
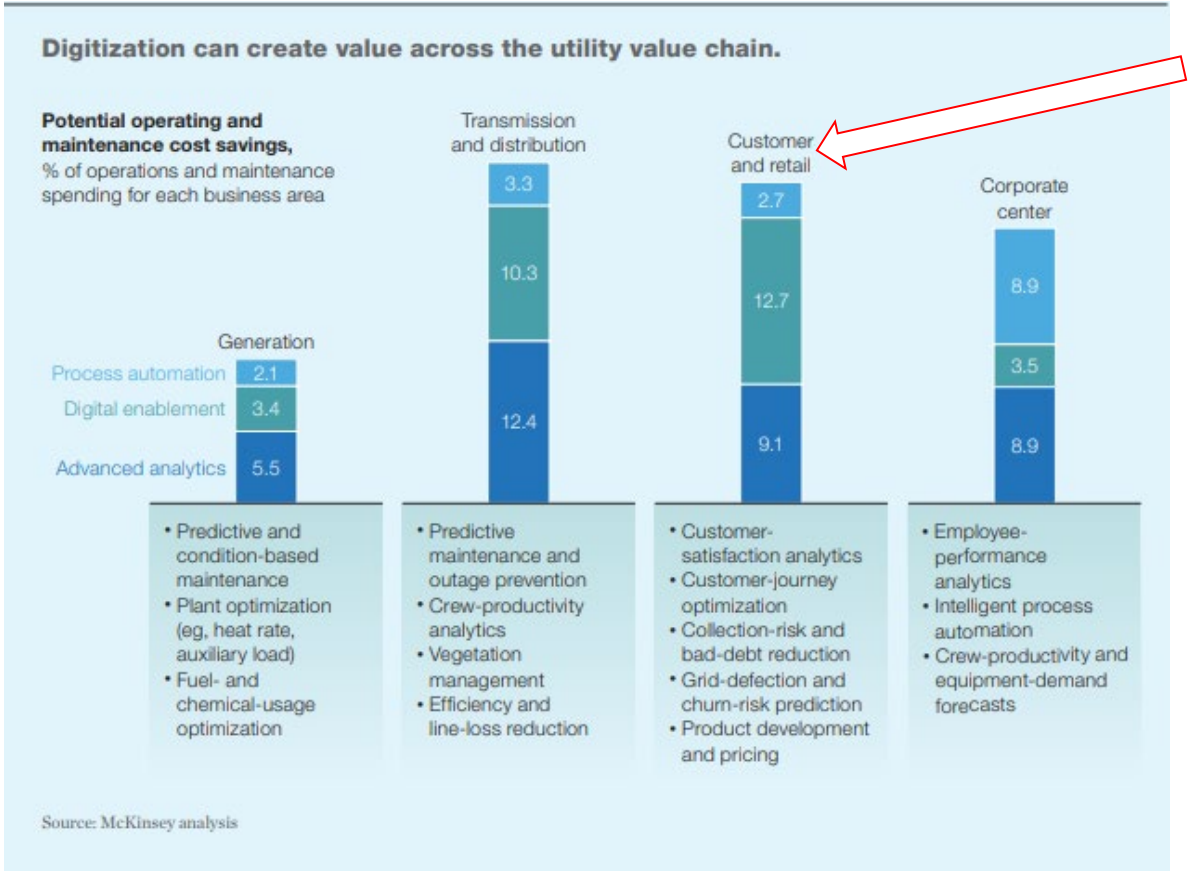

Operational Technology
Information Technology
OT
OT
IT
OT
IT
OT
IT
IT
Electro-mechanical
OS
Software, IP based Communication
Cloud, Big data
Digital Twin, I4, VR

Digital Framework for power Industry



Digital Transformation Creates O&M Savings



Digitalization can create **nearly 25%** O&M savings in the Customer area

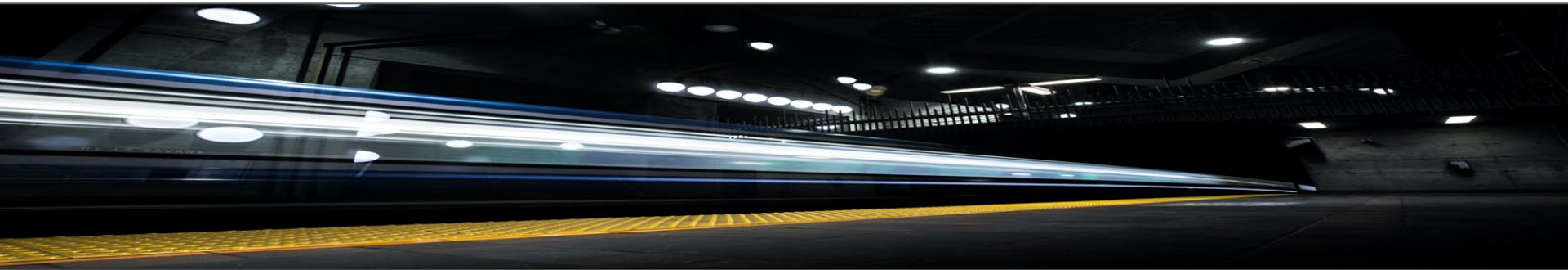
McKinsey, "The Digital Utility"

Generative AI is coming

- Data generation
- Energy pricing
- Demand forecasting
- Storage optimization

Source: https://www.smart-energy.com/features-analysis/how-generative-ai-is-coming-to-the-energy-sector/

Sustainability transformation



The Keys to a More Sustainable World

Utilities

are in the driver's seat

Reducing

Greenhouse Gas Emissions

Public Electricity and heat production accounts for 31% of emissions globally, making it the largest industry source of emissions

Increasing

Renewable Energy

CO2 emitted from coal combustion was responsible for over 0.3°C of the 1°C increase in global average temperatures - the single largest source of global temperature increase.

Increasing

Energy Efficiency

35% increase in energy efficiency will lead to 40% reduction in emissions

Emerging Environmental Sustainability Technologies

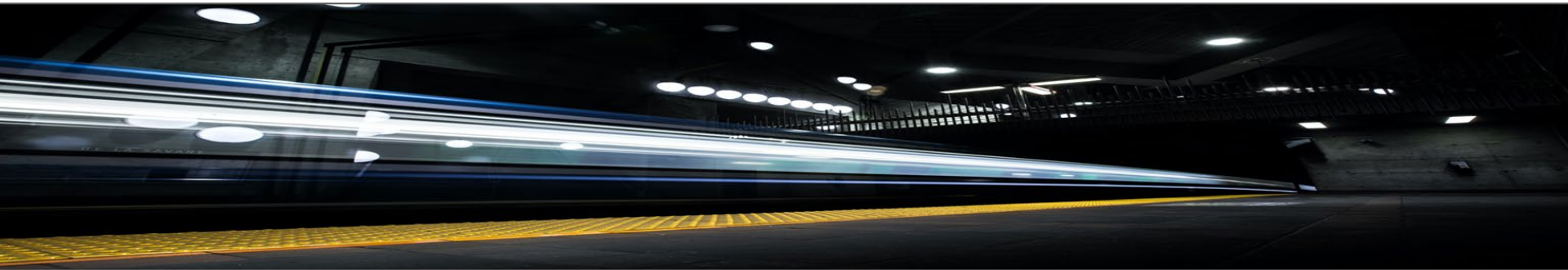
Carbon footprint measurement

Grid Management software

Cloud sustainability

Gartner, Inc.

Carbon footprint measurement



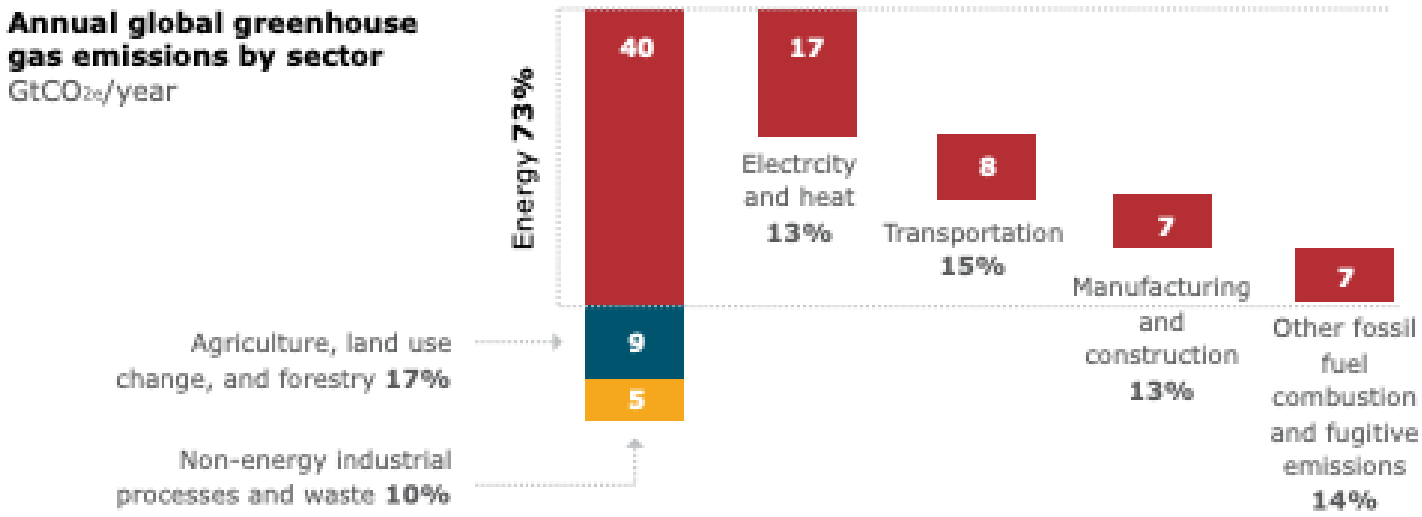
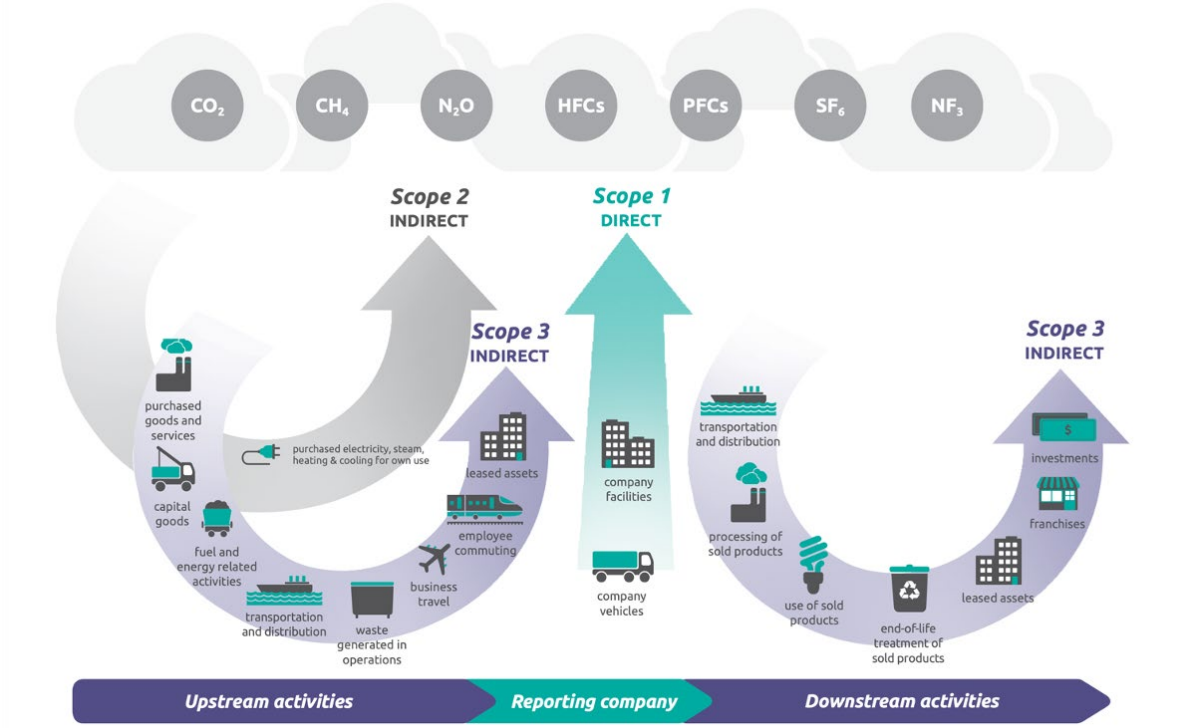


Figure 3: Annual global GHG emissions by sector based on recent historical data (Ørsted, 2020).

Global Goals

Greenhouse gas emissions



Scope 1 Emissions

Direct GHG emissions that occur from sources controlled or owned by an organization

Scope 2 Emissions

Indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling

Scope 3 Emissions

Value chain emissions associated with indirect activities from assets not owned or controlled by the organization

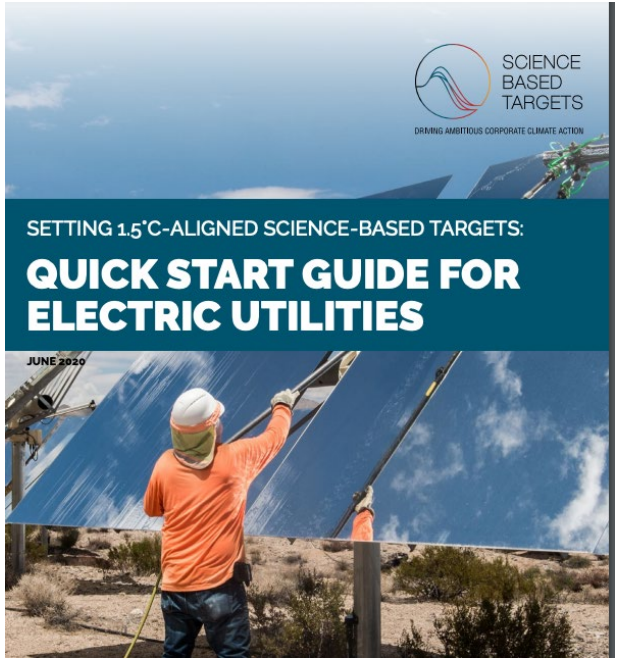
Reporting frameworks

Science based target

Provide companies with a clearly-defined path to reduce emissions in line with the Paris Agreement goals.

•See also: https://sciencebasedtargets.org/

Science-based target for Electric utilities



How to set a science-based target

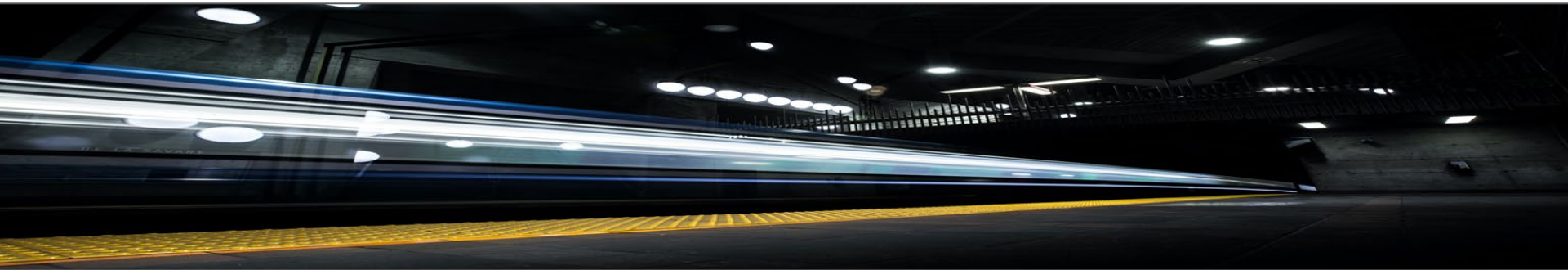
Step 1: Calculate emissions inventory

Step 2: Determine target scope and approach

Step 3: Construct targets

Step 4: Submit targets to SBTi

Advanced distribution management system (ADMS)



Advanced distribution management system (ADMS)

What is ADMS?

An enterprise app that can provide network operation observability and controllability

Functions

State Estimation

Outage Management

Demand Response

GE's GridOS Orchestration Software

What is GridOS?

to address the complexities of the modern grid, driven by decarbonization, electrification, and the integration of renewable energy sources and distributed energy resources (DERs)

Functions

- Grid Modelling
- DER Integration
- Market Enablement

Cloud sustainability

What is cloud?

- Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user.

Cloud & Sustainability

Migration

Transformation

Optimization

Migration

- Significant reduction in CO2 emissions
- Financial savings
- Energy efficiency

Transformation

Carbon footprint framework

Sustainable building management

Energy analytics and forecasting

Sustainable packaging

Optimization

- Moving to more sustainable data centre
- Leveraging efficient hardware's
- Minimise data movement
- Fostering sustainable practices

Take-Aways

- Key trends & challenges in energy sector
- Key capabilities required for power sector
- Digital transformation elements
- Sustainability transformation elements

Thank you!