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SUSTAINABILITY EXCELLENCE IN MANUFACTURING

Bringing sustainability strategies to life on the plant-floor

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Operational Challenges Manufacturers Face

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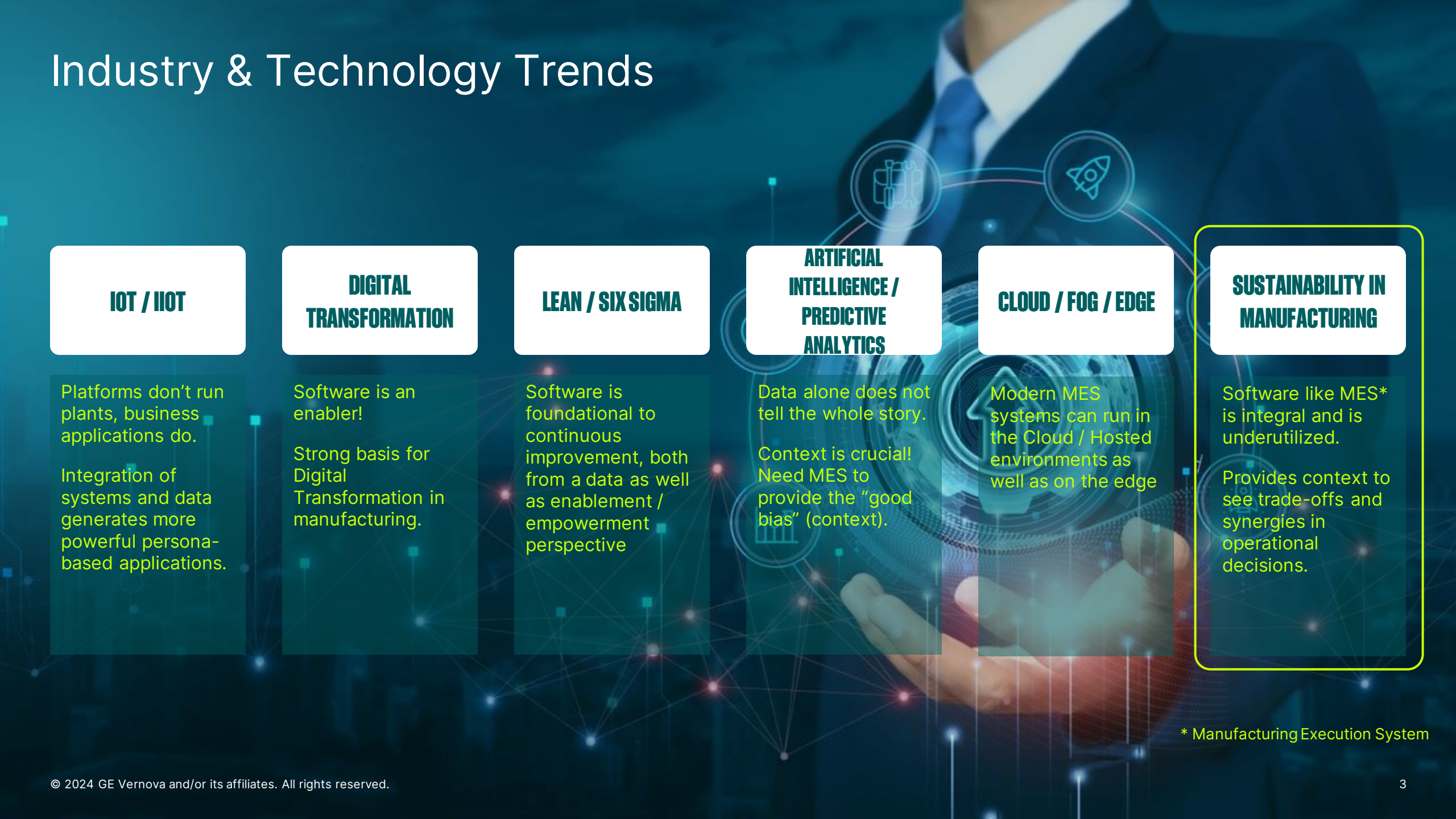
FRAGMENTED & UNTAPPED DATA

SILOED SYSTEMS (IT, OT)

OUTDATED INFORMATION

LABOR DISRUPTION

Industry & Technology Trends



IOT / IIOT

Platforms don't run plants, business applications do.

Integration of systems and data generates more powerful persona-based applications.

DIGITAL TRANSFORMATION

Software is an enabler!

Strong basis for Digital Transformation in manufacturing.

LEAN / SIX SIGMA

Software is foundational to continuous improvement, both from a data as well as enablement / empowerment perspective

ARTIFICIAL INTELLIGENCE / PREDICTIVE ANALYTICS

Data alone does not tell the whole story.

Context is crucial! Need MES to provide the "good bias" (context).

CLOUD / FOG / EDGE

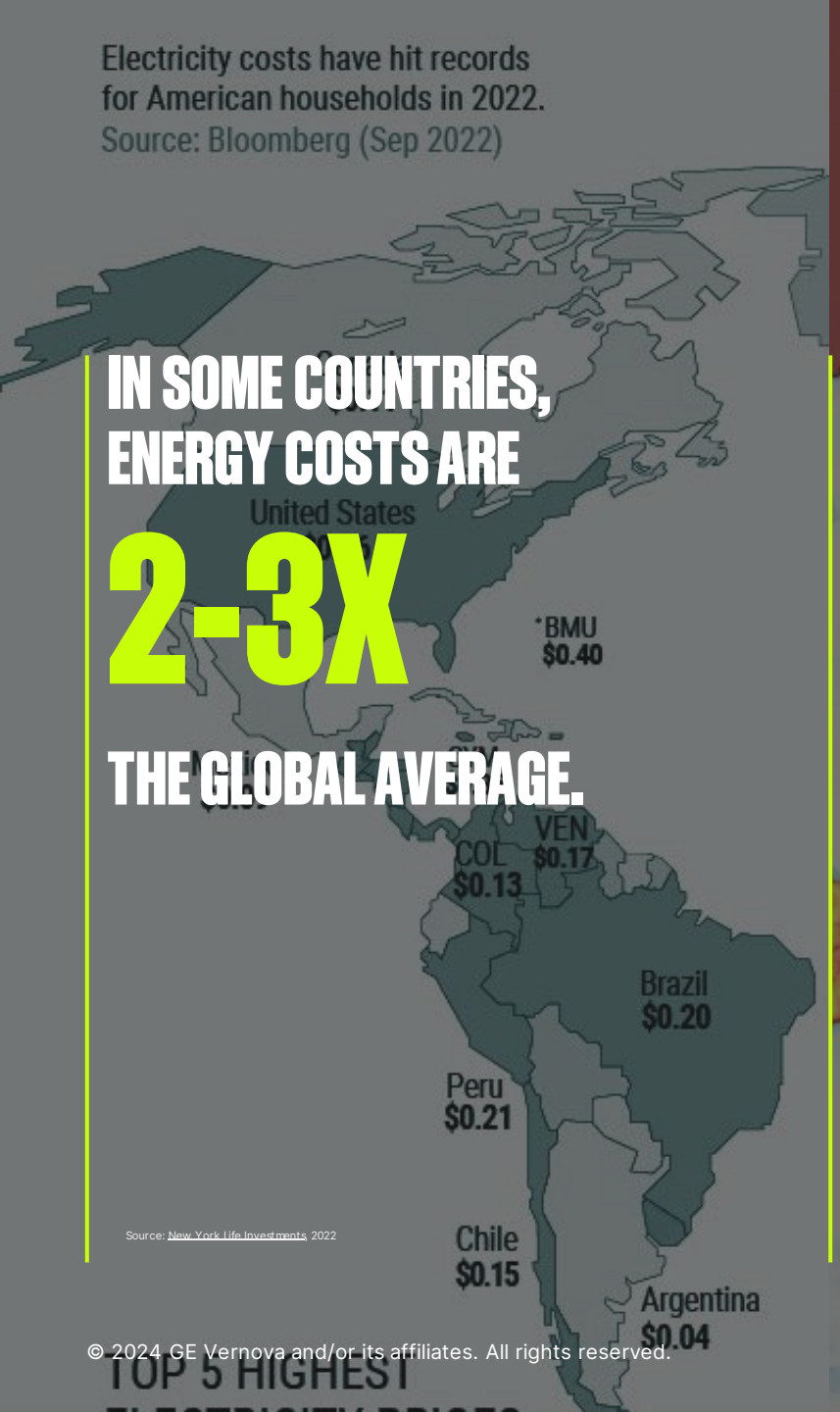
Modern MES systems can run in the Cloud / Hosted environments as well as on the edge

SUSTAINABILITY IN MANUFACTURING

Software like MES* is integral and is underutilized.

Provides context to see trade-offs and synergies in operational decisions.

* Manufacturing Execution System



IN SOME COUNTRIES, ENERGY COSTS ARE

2-3X

THE GLOBAL AVERAGE.

Source: New York Life Investments, 2022

THE FUTURE COST OF WATER RISK TO BUSINESS MAY BE

5X HIGHER

WITHOUT MITIGATION.

1. Aqueduct Water Risk Atlas, 2023
2. PDB 2021

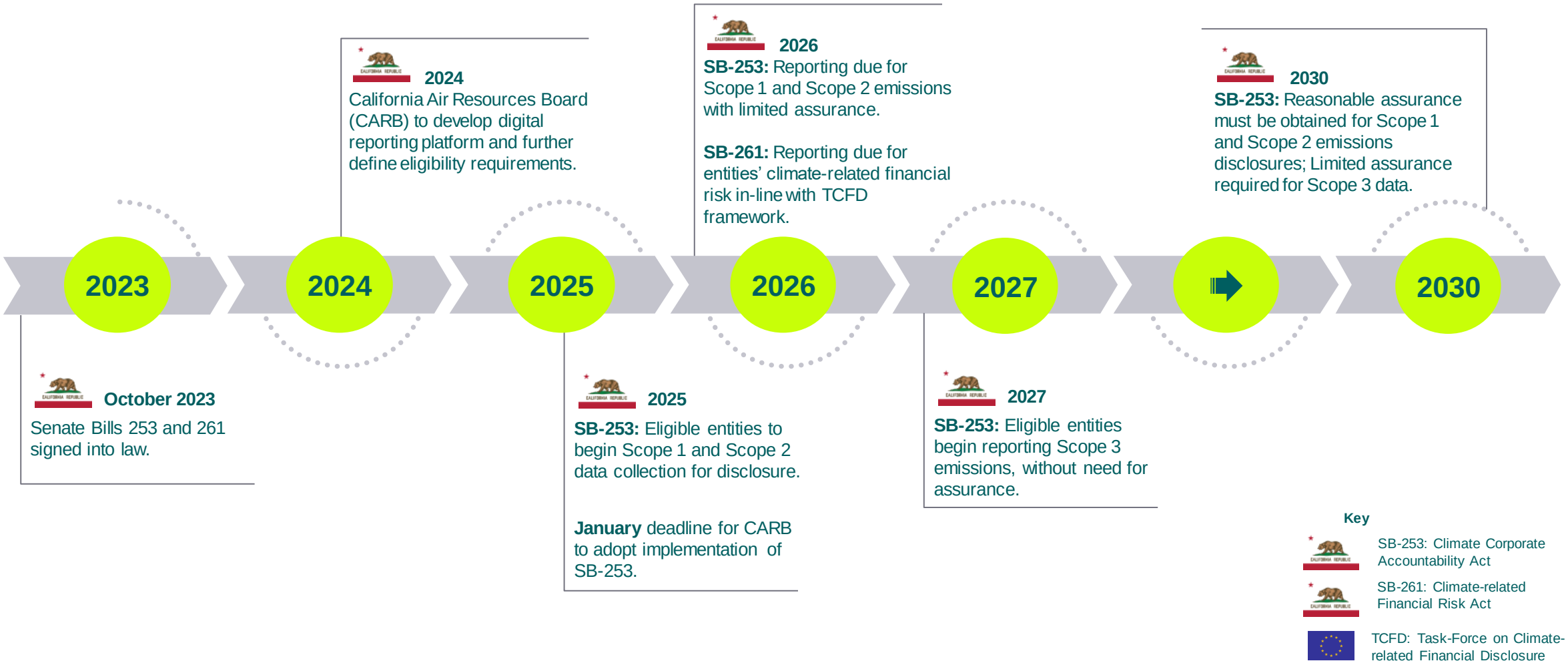
REGULATIONS ON CLIMATE, WASTE, AND CIRCULAR ECONOMY ARE

HERE

AND HERE TO STAY

1. EY, 2022

Highlight of California Regulations: SB-253 and SB-261



The pressure to act on sustainability is ever-growing

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Investor Pressure

78%

More than 3 in 4 investors view sustainability investments as a risk mitigation strategy (Cognizant).

ESG-minded investment funds will represent 50% of all professionally managed assets globally by 2024 (Deloitte).

Digital Transformation

57%

57% of executives at $500M+ enterprises report **data availability and data quality as the greatest challenges** to meet ESG disclosure requirements (Deloitte).

Delivering a meaningful sustainability strategy is hard, but ***Digital Transformation is an enabler***

Companies are setting targets to meet stakeholder expectations, but the path to action is often unclear

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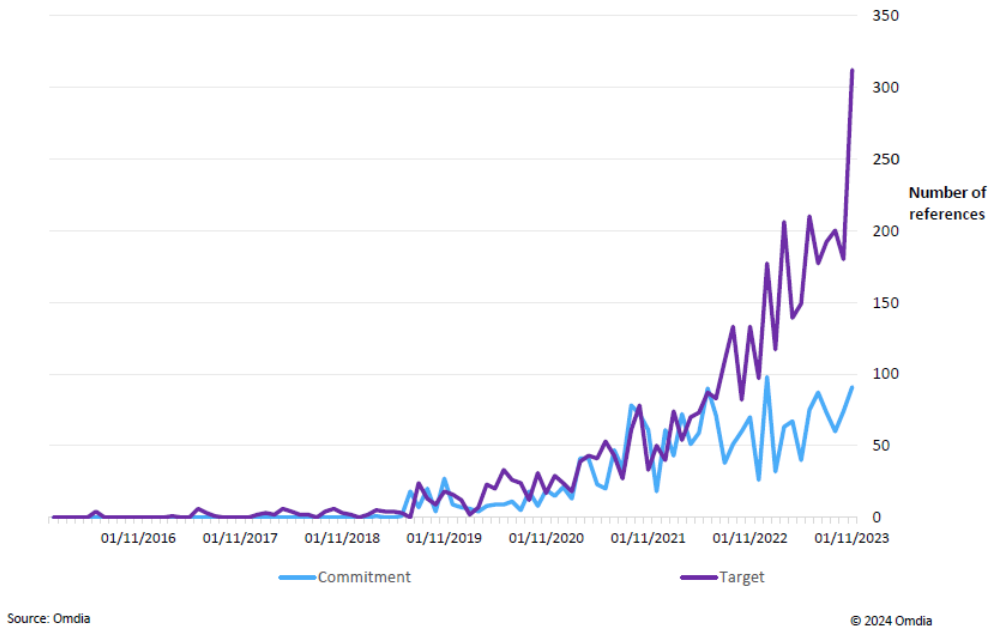
Science-based Targets Initiative (SBTi) – Goals and commitments by manufacturers are skyrocketing…



Source: Omdia

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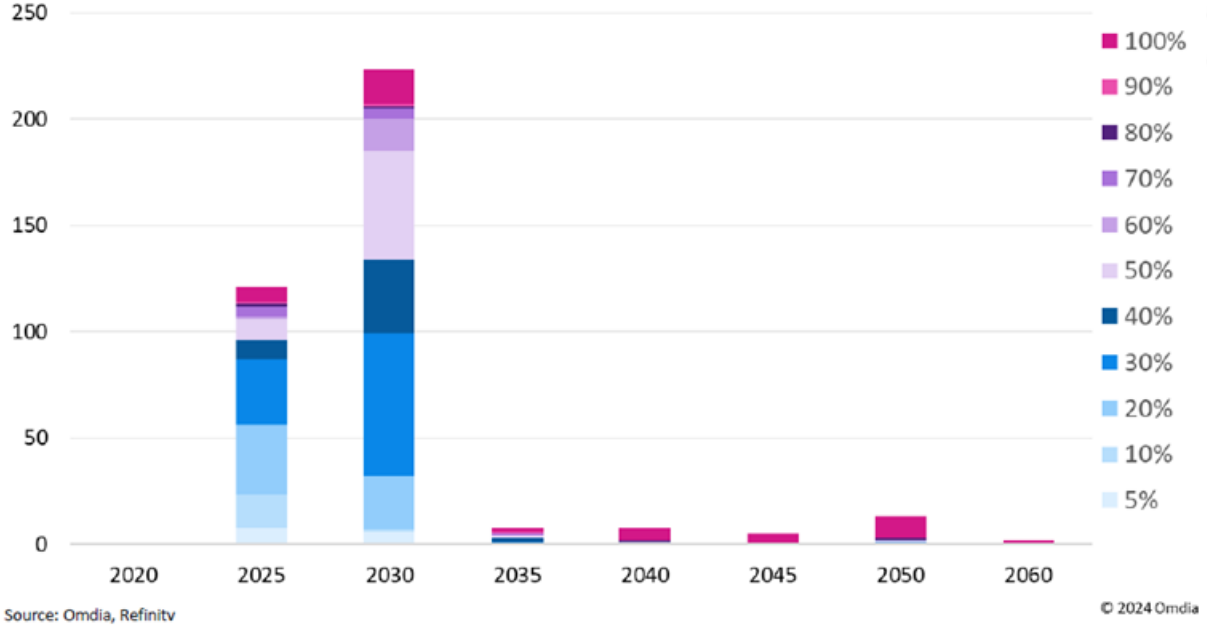
… yet, manufacturers' emissions reduction targets and timelines show a gap to actioning them



Source: Omdia, Refinitv

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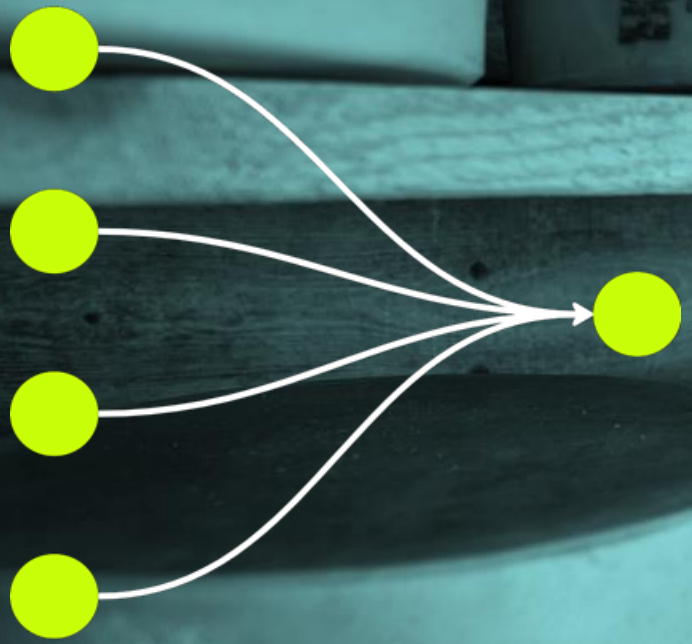
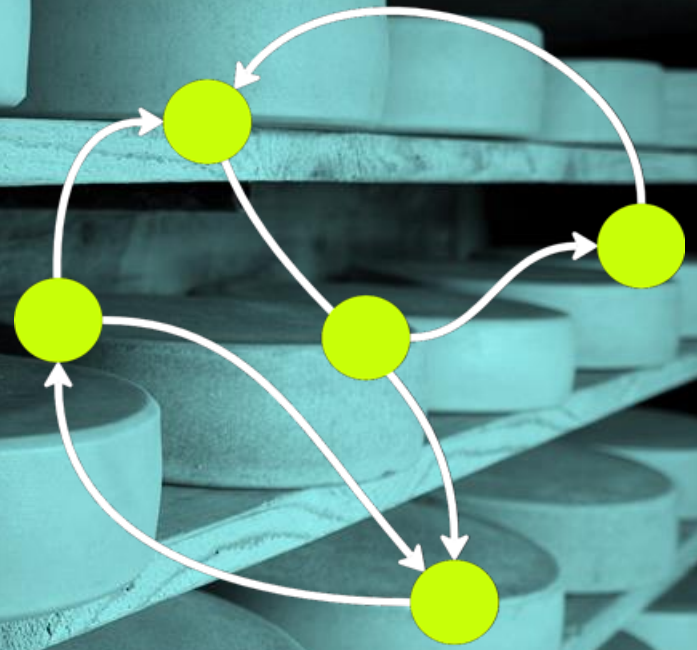
KEY QUESTION:
HOW TO *ACT* ON SUSTAINABILITY GOALS?

OPERATIONS AND SUSTAINABILITY OBJECTIVES ARE INTERCONNECTED





FROM MANAGING IN SILOES ➡ SYSTEMS OPTIMIZATOIN

OPERATIONS AND SUSTAINABILITY OBJECTIVES ARE INTERCONNECTED

VALUE

To realize synergies between profitability and sustainability, a new set of challenges must be solved

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01 OPERATIONALIZE ENVIRONMENTAL SUSTAINABILITY GOALS

- Provide the data quality and granularity needed to act
- Gain traceability to the plant floor on metrics such as Scope 1 & 2 emissions, water usage, etc.
- Unlock daily management of Carbon Neutrality glidepaths

02 BREAK SILOES BETWEEN OPS AND SUSTAINABILITY

- Link sustainability metrics required by regulation to Ops performance management processes
- Manage sustainability KPIs with the same rigor and routine as Quality or OEE

03 PROVIDE PROCESS CONTEXT NEEDED TO TRULY OPTIMIZE

- Determine the most impactful levers within operational constraints
- Attribute resource usage to products, assets, events
- Benchmark against best demonstrated performance – for each process configuration

Context is critical to operationalizing environmental KPIs
and optimizing manufacturing priorities holistically

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SOFTWARE AS THE CONNECTIVE TISSUE

Data is the foundation of Digital Transformation and contextualized data facilitates informed action

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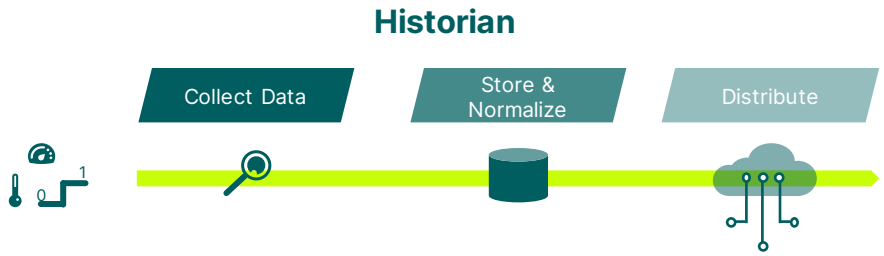
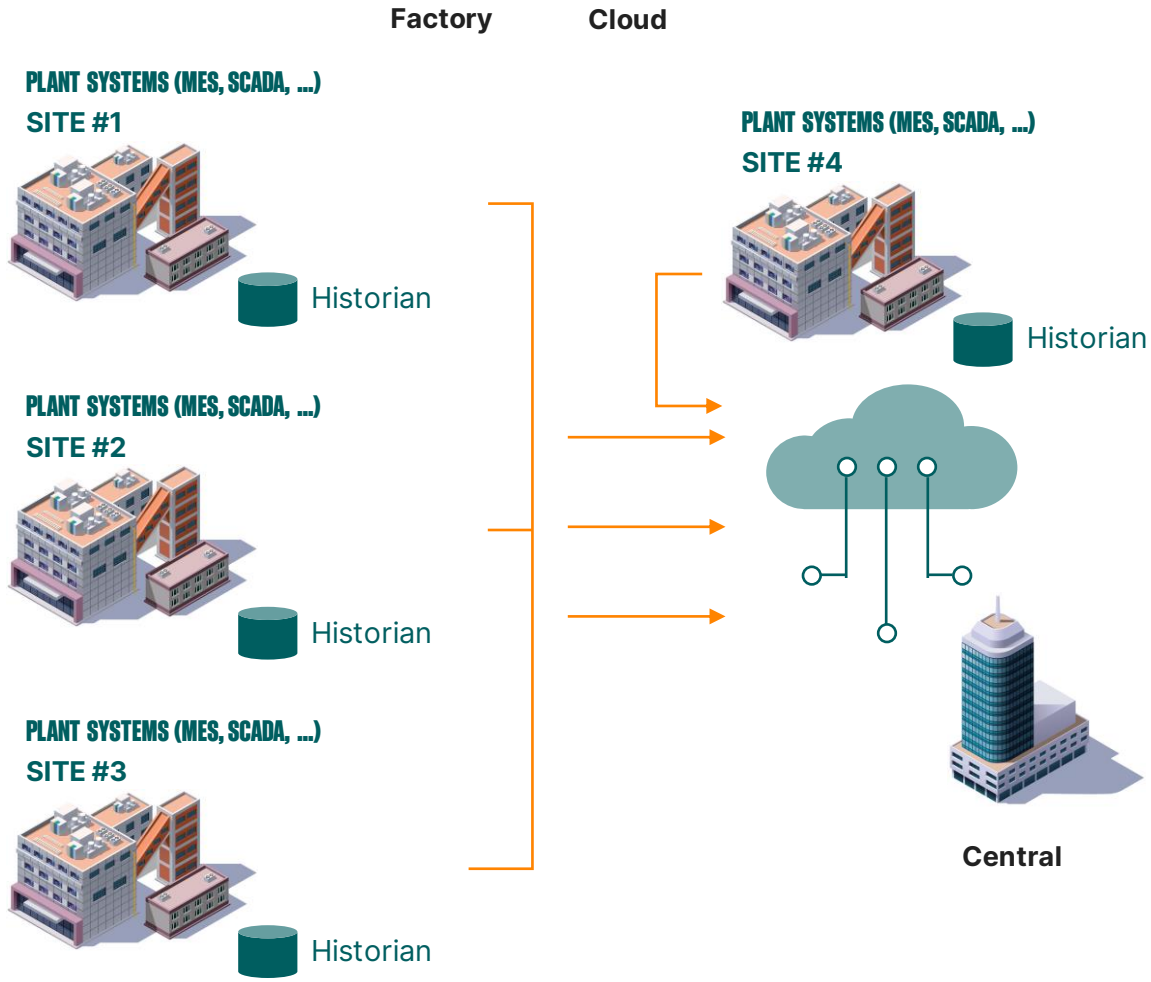
Connect, collect, store & distribute data across sites:

- ✓ No more data gaps & a holistic view of the performance
- ✓ Reliable and consistent information – ready for visualization, reporting & analysis

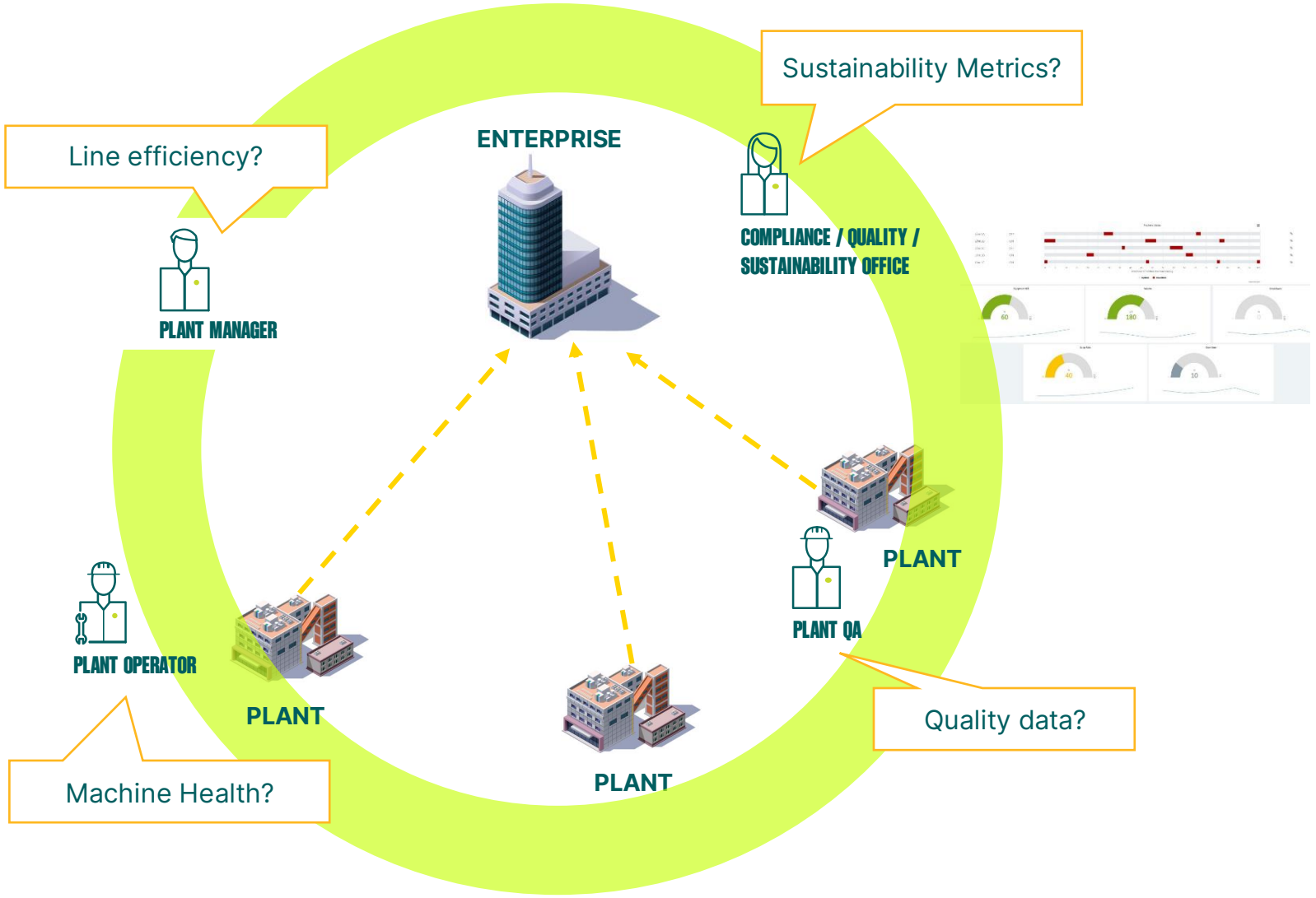




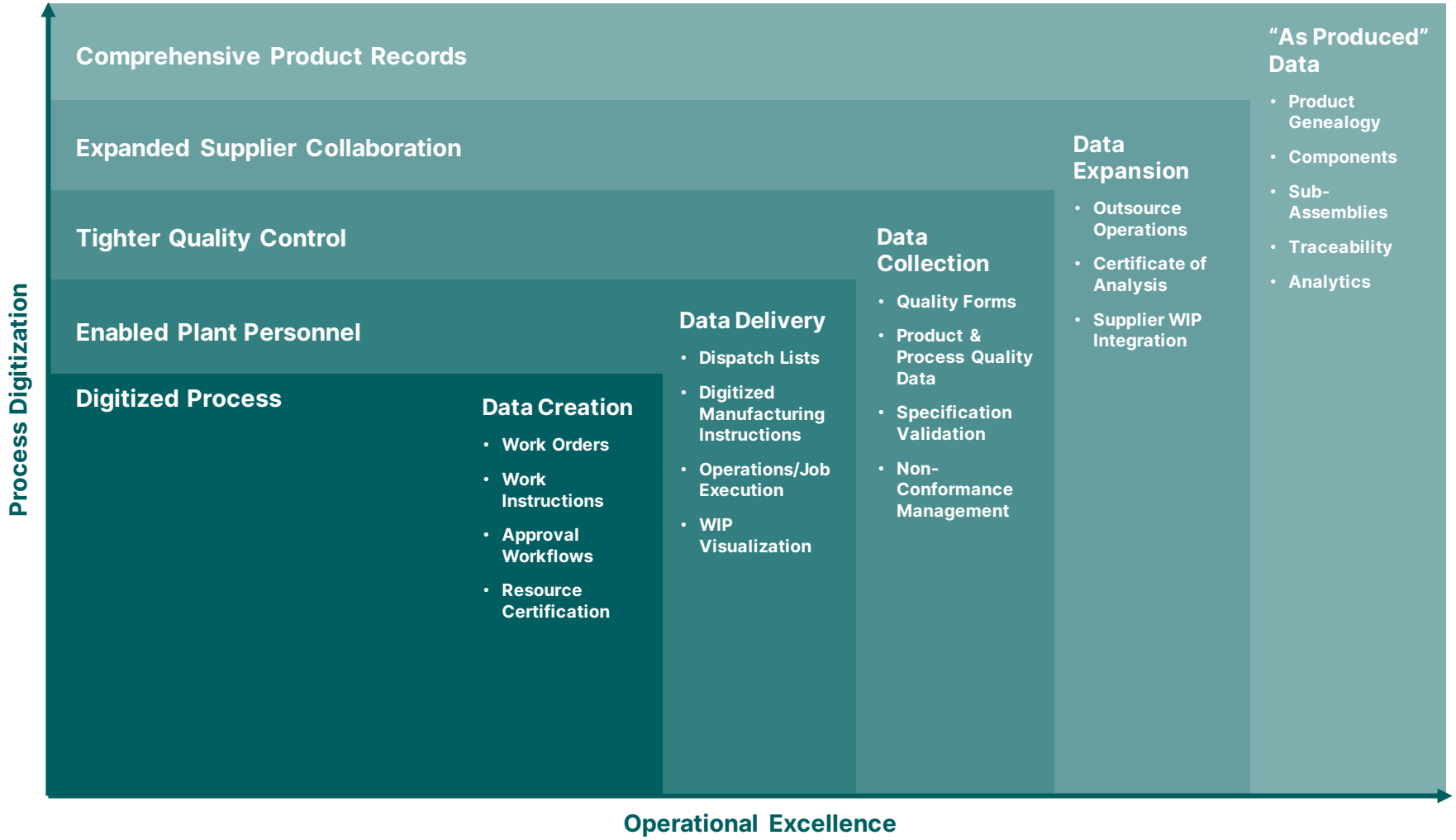
Software can create a single pane of glass across the enterprise

Access to the information needed, when needed, by whomever needs it

- Common context driven by a model
- Single designer for all Operational applications
- Total Operations view
- Persona-based interaction and access



Digitization in the dairy industry unlocks multi-dimensional value



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MANUFACTURING SOFTWARE PROVEN FOR OPERATIONAL CHALLENGES... AND ENVIRONMENTAL PERFORMANCE

What a Manufacturing Execution System does ...

“Manages, monitors and synchronizes the execution of real- time, physical processes and people involved in transforming raw materials into intermediate and/or finished goods.”

Gartner

Manufacturing Execution Systems (MES)

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Outcomes

- Maximize Operations Management,
- Improve production performance,
- Drive product quality…

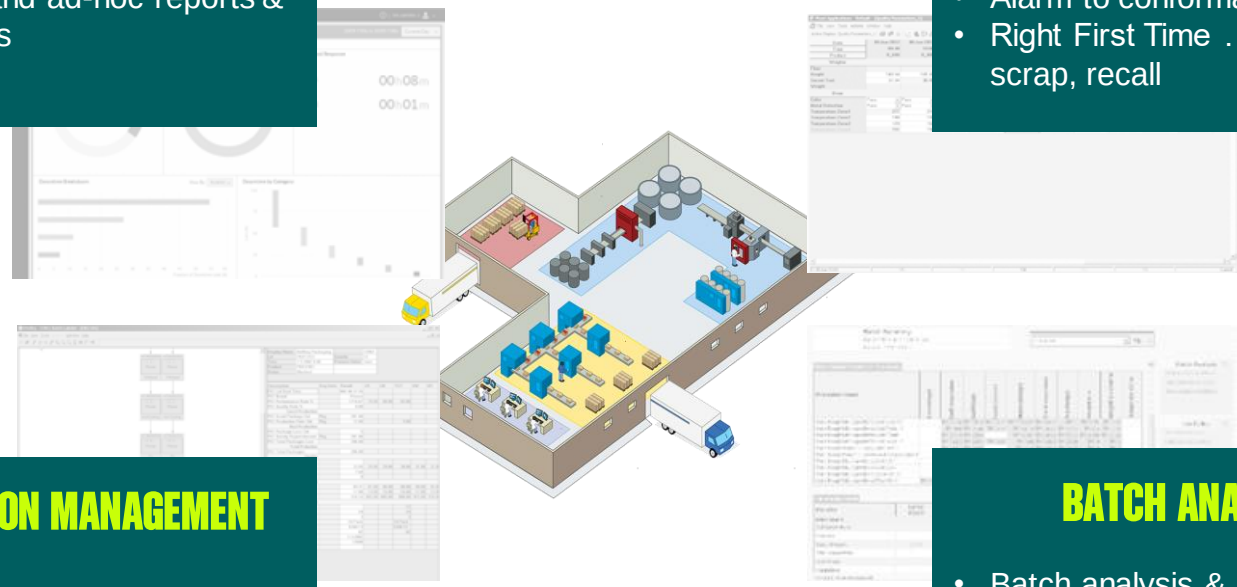
… and action sustainability priorities

EFFICIENCY MANAGEMENT

- OEE and root causes
- Track downtime & waste
- Standard and ad-hoc reports & dashboards

QUALITY MANAGEMENT

- R/T product, process quality analysis & control
- Alarm to conformance limits
- Right First Time … lower waste, scrap, recall



PRODUCTION MANAGEMENT

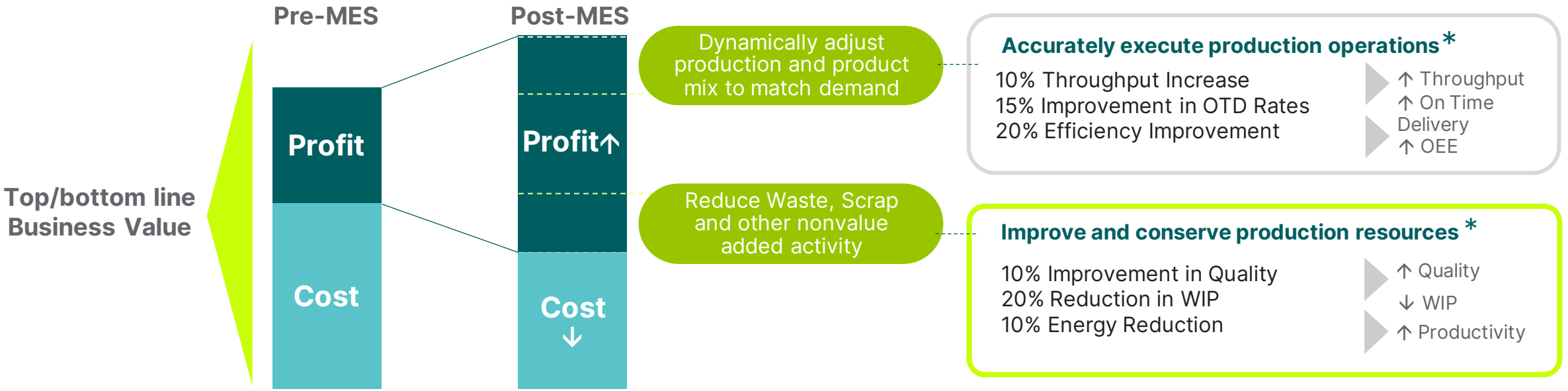
- Track & trace genealogy of products
- Production schedule execution & tracking
- Monitor consumption of resources

BATCH ANALYSIS

- Batch analysis & ISA-88 reporting
- Electronic batch records
- Analysis of scheduled and completed batches

What an MES delivers …

Optimize production execution to improve quality, increase throughput and enhance visibility into production to maintain high levels of customer satisfaction and brand equity



* Proficy Customers testimonials, results will vary

Embedding sustainability data in Manufacturing Execution Systems helps drive sustainable operational excellence

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Data collection & consolidation

Consolidate data from heterogeneous sources – **address data availability**

- Shop floor systems (automation)
- LIMS systems
- ERP data (Financial, production, etc.)
- Manual Data Input
- Barcode, QR
- Files
- Weather data

Contextualization

Put data in context and provide a structure / model

- Resource consumption or emissions by product SKU, Batch, Lot, Serial
- Machine, Production Line, Process Step
- Materials, Material family, Grade
- Storage Tanks, Bins

Analysis & Analytics

- Real-time monitoring
- Condition-based alerts
- Process analytics using AI/ML
- Analyze data across sources, e.g., across production sites (centerlining)
- Best demonstrated performance (in context)
- Variable Statistics Analysis

Visualization

- Break organizational silos
- Deliver information to the right stakeholders for fast action
- Create visual summaries (ad-hoc) of data to alert decision makers
- Call attention to the most important information of the moment.
- Genealogy

Information Broadcast

- Close the loop on analytics for improvement
- Automatically transfer & receive information (to/from the plant floor, to/from the enterprise systems)
- Create a bottoms-up foundation for internal and external sustainability communications

PUTTING THE THEORY INTO PRACTICE

Overlaying resource usage data with operations context opens doors to active management of sustainability KPIs

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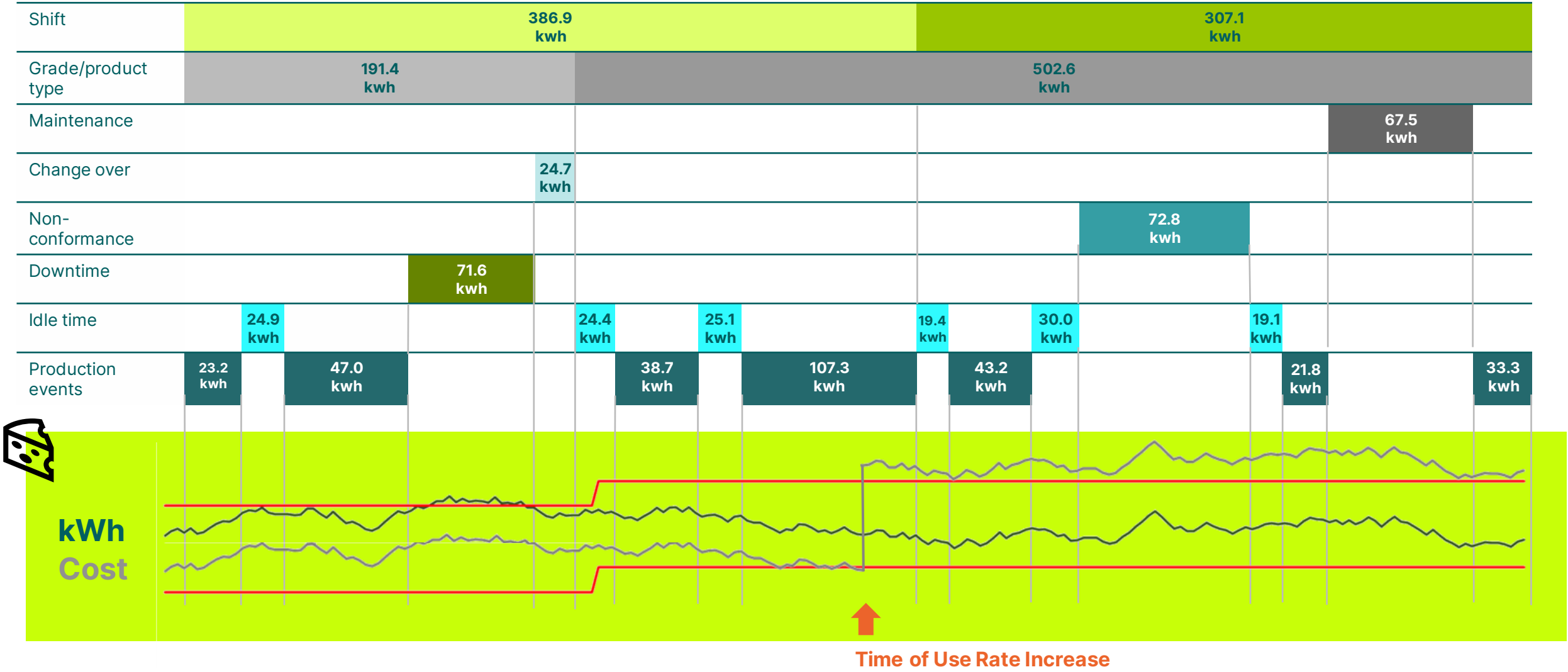
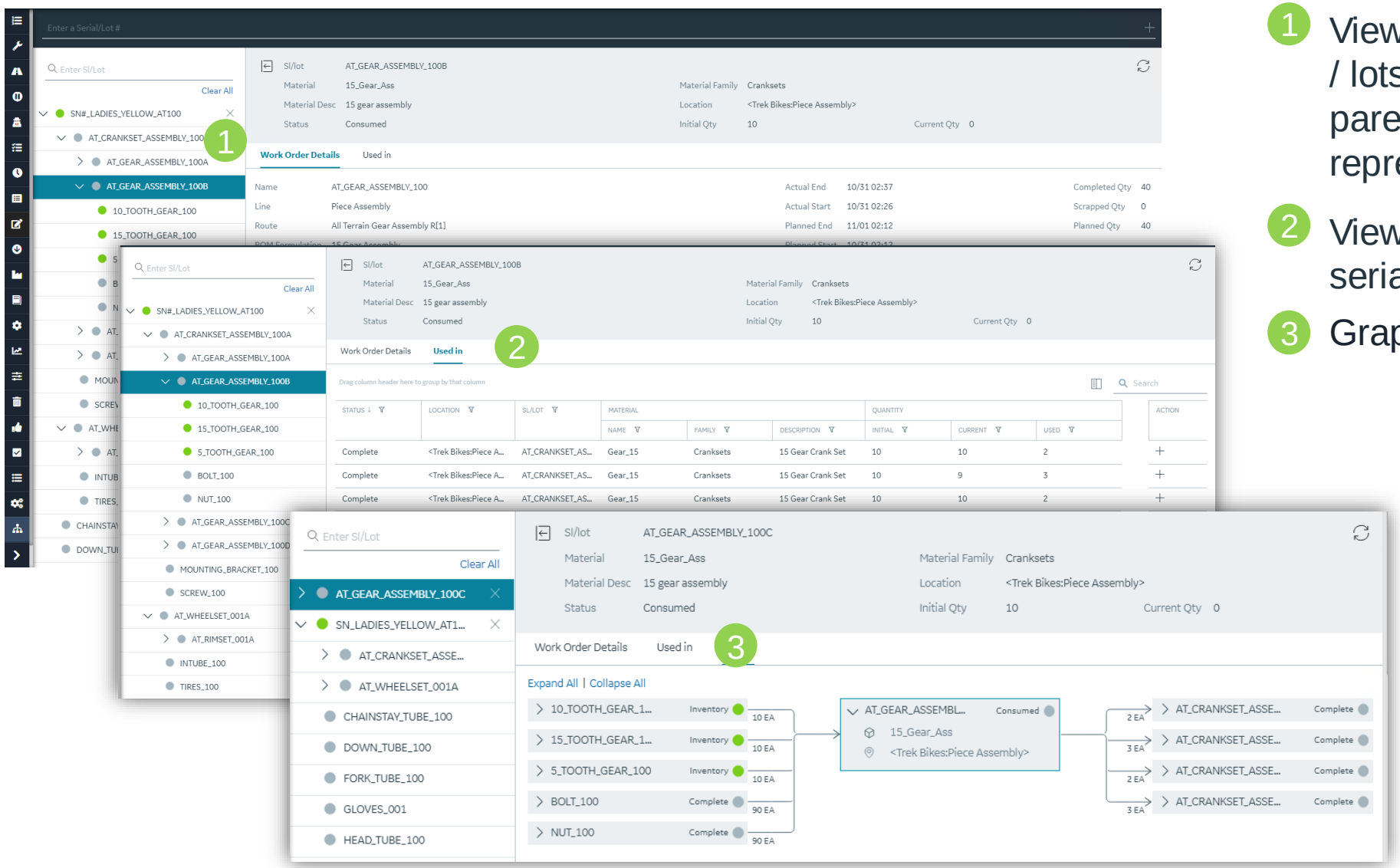


Genealogy supports product sustainability data



1. View Genealogy links for serials / lots / batches with complete parent / child hierarchies represented
2. View details of each link (lot / serial) and where used
3. Graphical view

Genealogy: Energy, water & carbon at each process step

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Inventory 1020
Start time: **June 8th 2023 07:14:40**
Additive#: **RMi098978we43**

Batch: **BA12300EA**
Purchase order: **POMB876eW8**

Quality
Test A: **Ok**
Test B: **Ok**

Total energy consumption: **12.865 MWh**
Total water consumption: **1.005 L**

Mixer 1135
Start time: **Aug 8th 2023 09:23:18**
Batch#: **129832124**

Task A
Timestamp: **Aug 8th 2023 09:23:44**
Additive ID: **RMi098978we43**

Speed
Speed: **51 RPM**

Lower Reject Limit	Lower Warning Limit	Target	Upper Warning Limit	Upper Reject Limit
37 RPM	42 RPM	50 RPM	58 RPM	63 RPM

Total energy consumption: **53.242 MWh**
Total water consumption: **2.223 L**
End time: **Aug 8th 2023 09:25:32**

Test Station 1145
Start time: **Aug 8th 2023 09:27:44**
Batch#: **129832124**
Operator: **Mr. Hall**

Test A
Timestamp: **Aug 8th 2023 09:27:58**
Pass: **Ok**

Test B
Timestamp: **Aug 8th 2023 09:28:41**
Pass: **Fail**

Total energy consumption: **0.043 MWh**
Total water consumption: **0.003 L**
End time: **Aug 8th 2023 09:29:43**

Non Conformance
Start time: **Aug 8th 2023 09:29:26**
Reason: **pH to low**
Action: **Adjusted additive A**
Energy consumption: **0.003 MWh**
Water consumption: **0.001 L**
End time: **Aug 8th 2023 09:37:28**

Station 1145
Start time: **Aug 8th 2023 09:41:31**
Batch#: **129832124**
Operator: **Mr. Hall**

Test A
Timestamp: **Aug 8th 2023 09:41:58**
Pass: **Ok**

Test B
Timestamp: **Aug 8th 2023 09:43:05**
Pass: **Ok**

Total energy consumption: **0.039 MWh**
Total water consumption: **0.005 L**
End time: **Aug 8th 2023 09:45:09**

Advanced analytics for optimizing systems holistically

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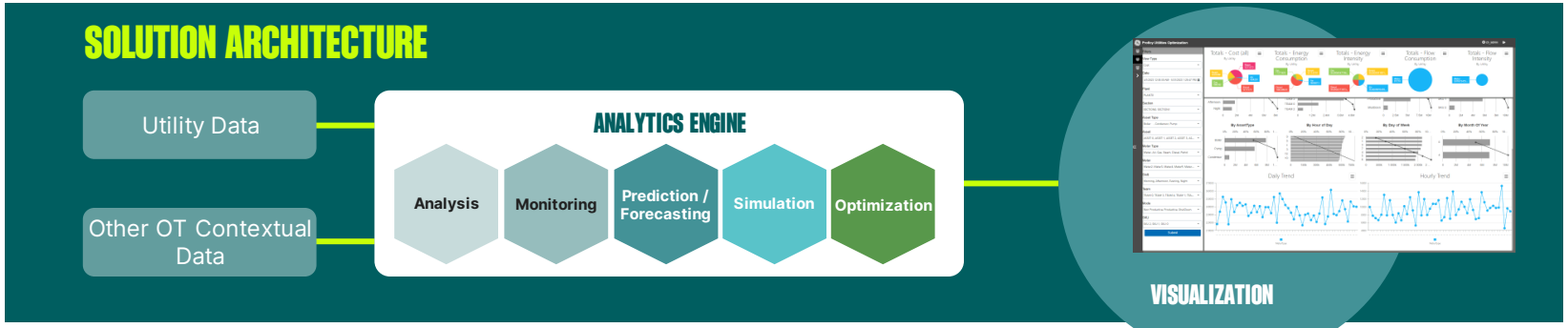

BENCHMARK

CORRELATE CONSUMPTION IN MANUFACTURING CONTEXT IN REAL TIME

Production
- Product SKU
- Process area, Production line
- Operational events
- Shift, Time of Day, Weather conditions

Organizational
- Enterprise, Business, Region
- Site, Factory, Production team/crew

Environmental
- Correlate consumption to Scope 1 & Scope 2 emissions, water use, energy intensity, etc.

EXPLAIN

REDUCE CONSUMPTION & EMISSIONS AT THE PROCESS AND PRODUCTION LEVELS

Process Level
- Find inefficient equipment
- Find usage during non-production periods
- Find unrecognized patterns, waste and improvement opportunities

Production Level
- Map resource intensity of product portfolio
- Find best practices; Standardize operations
- Contextualize data to help manage sustainability KPIs from the plant floor

OPTIMIZE

OPTIMIZE USAGE AND COSTS ACROSS PRODUCTION RUNS & SITES

Production Runs
- Optimize schedule for resource efficiency
- Lower variability across multiple production runs
- Curtail, shift production in high-cost periods

Sites & Supply Networks
- Holistically optimize the production process accounting for cost & environmental impact
- Optimize production plans using resource and emissions intensity as an input
- Improve supply chain flexibility & resilience

SUMMARY

Manufacturing companies are struggling to act upon their sustainability ambitions:
the action-ambition gap!

To achieve sustainable operational excellence, industrial companies need to **manage sustainability and production together in context.**

Embedding sustainability metrics into an MES helps drive holistic optimization in the factory & drive **active management of sustainability goals.**

THE NEED FOR HOLISTIC MANAGEMENT: SUSTAINABLE OPERATIONAL EXCELLENCE

Strategically **integrating environmental data into core business practices**, will lead to long-term success and positive impact for Dairy Operators.

Thank you!

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