

IT as an Enabler for Decarbonized Digital Product Engineering

Designing sustainable cars in a sustainable way

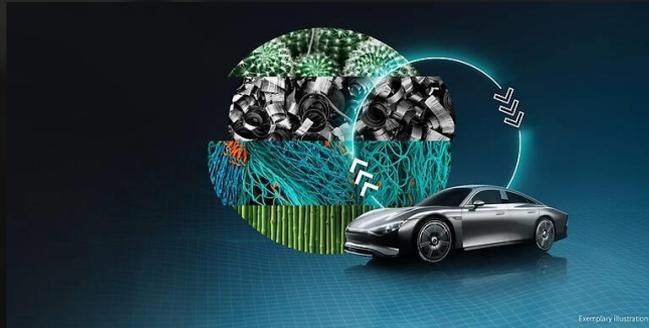
Atos science + computing
November 2022

From concept vehicle to mass production

How can sustainable design practices and processes be used daily?

Two main focus areas with their unique challenges:

Design sustainable cars



↓ CO₂ ♻️

Leverage a sustainable design process



Atos tackles both challenges jointly with our customers and partners

Who is Atos?

The leader in secure and decarbonized digital

700+

large manufacturers trust us 24x7

In Aerospace,,
Automotive,
CPG/Process,
Chemical & Discrete
Manufacturing



in 71+ countries
on 5 continents

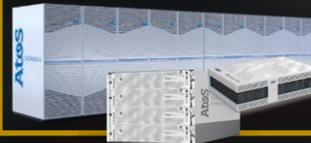
We build
Smart
Industries

From
product-centric
to service-centric
models and
ecosystems



We shape the
data-driven
industry platforms

#1 Europe, #4 ww
In HPC, AI & Quantum



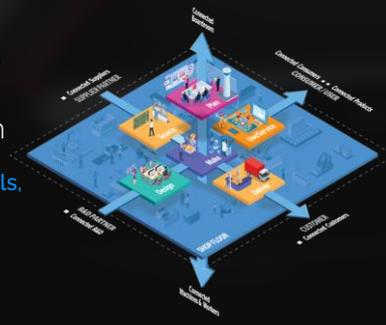
We invent
next generation
industry resilience

#1 Europe, #2 ww



We provide ultimate
business agility
to accelerate growth

Direct2Consumer channels,
As a service models
Autonomous vehicles, ...



We lead the way
to NET Zero
industries

#1 in Sustainability
ecoact

We co-innovate with
world leaders to
invent **the future**
of Manufacturing

In all sectors



*Named, active clients only

Supporting our customers in their decarbonization journey

From green IT to IT for green, sustainability advisory, life cycle assessments and more

Technology

Atos

A world IT player and Digital Transformation leader.

Sustainability

ecoact
an atos company

A leading consulting firm in decarbonization and net-zero trajectories.

R&D innovation

Digital Portfolio

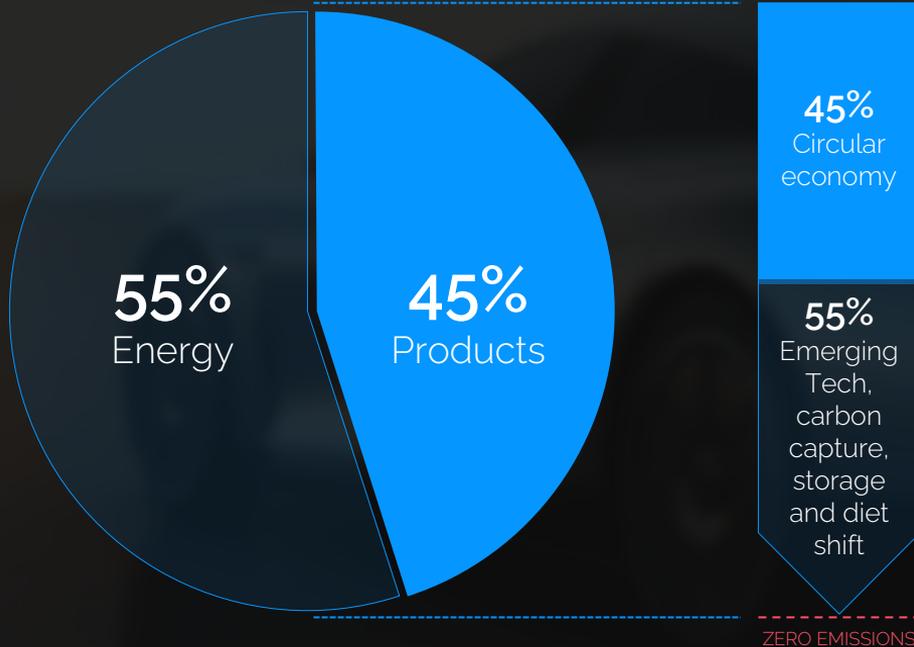
Advisory

Carbon credits

Build the market-first
end-to-end portfolio to
create faster paths to
net-zero

Case for action: Designing sustainable products

Addressing a big part of carbon emissions



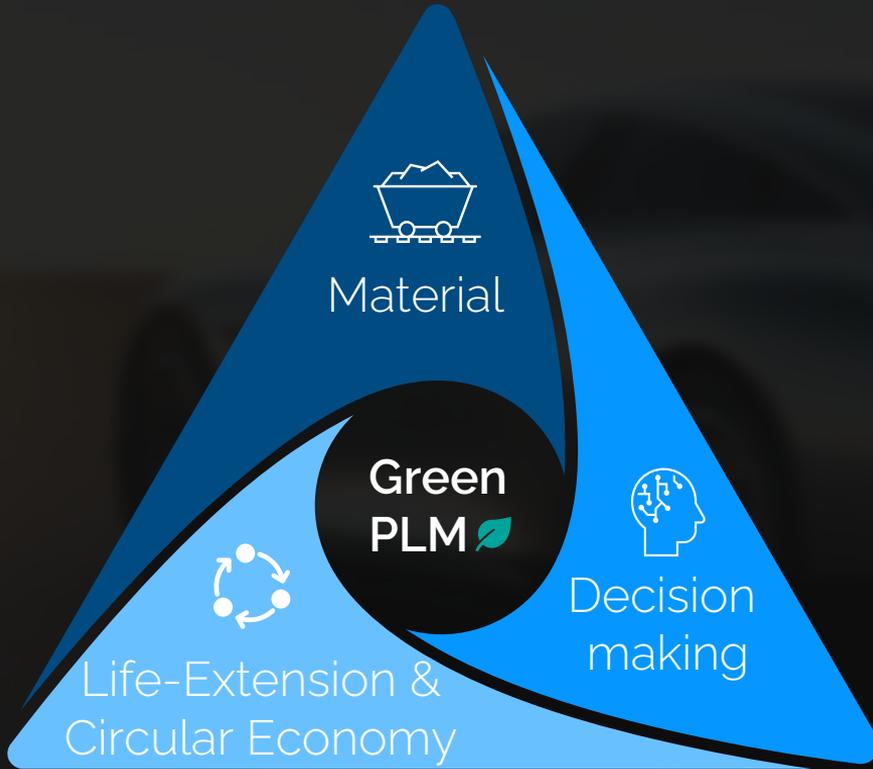
Our options

- »»» Use less materials
- »»» Use materials with lower embodied emissions
- »»» Keep products in life for longer

+ Circular economy

The concept of “Green PLM”

Embed sustainability in each and every product



We need to ...

... **quantify** the environmental impact of products during product design

... have the ability **to take decisions** to reduce and manage the product's impact

Material & Decision support: Gaining emission information

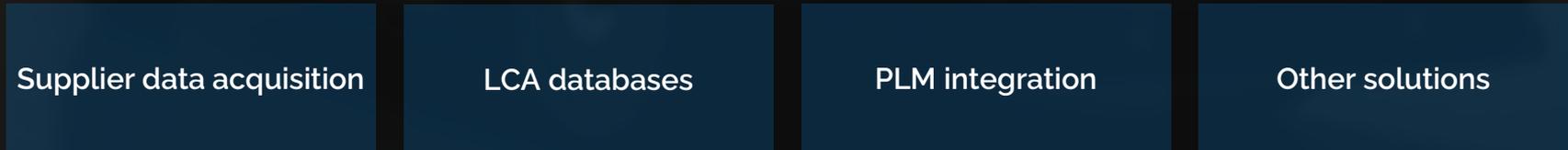
Understand a vehicles sustainability performance over its whole life cycle

- CO₂ footprint of raw materials >>> suppliers / emission databases
- CO₂ footprint of purchased components >>> suppliers
- Sustainability regulations & other factors >>> Various systems if available at all

 **Data availability, data quality, data integration**



A set of possible approaches and solutions that Atos covers:



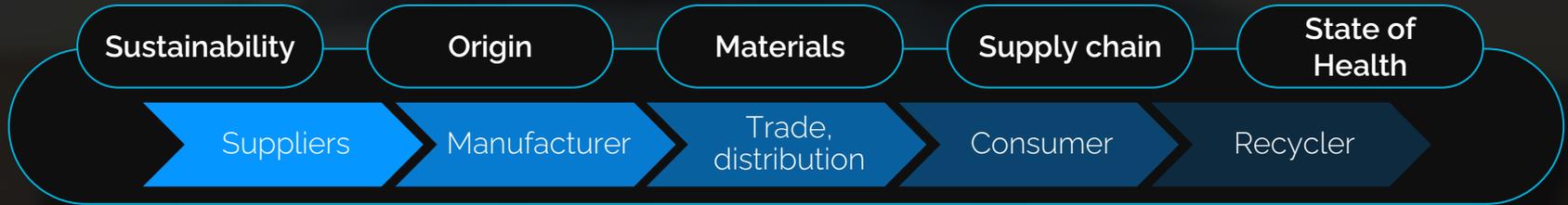
Life extension: Leverage environmental and economic modelling

An example for electric vehicles: Catena-X Digital Battery Passport Working Group



Digital battery passport

Include the battery in the circular economy completely



A set of skills and solutions that Atos can provide:

Gaia-X & other
Ecosystems

Building IDS connectors

Digital platforms

IT Security, IP Mgt., etc.

How to get started with Green PLM?

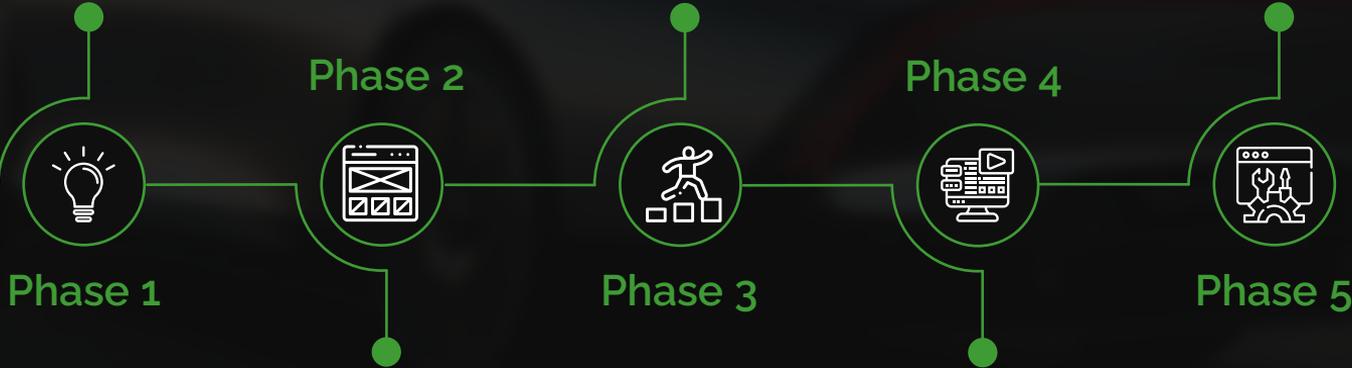
Atos offers co-creation workshops with clear outcomes to get Green PLM started



Innovation & Co-creation Workshop

Follow-up session to review progress

Co-development possibilities



Phase 1

Phase 2

Phase 3

Phase 4

Phase 5

Deep-dive on one or more use cases
Sketch & Wireframing of first ideas

Develop a high-fidelity mockup/prototype for
one or more use cases

Sustainability vs High Performance Computing

Simulation is key enabler for faster creation of CO2-friendly cars

But can fast be green?

PC

AI Could Save the World, If It Doesn't Ruin the Environment First

THE ECONOMIST

Academic supercomputers 'can be worse for environment than flying'

"HPC power consumption is skyrocketing"

"There is an explosion ahead of us"

nature

How to stop data centres from gobbling up the world's electricity

The Guardian

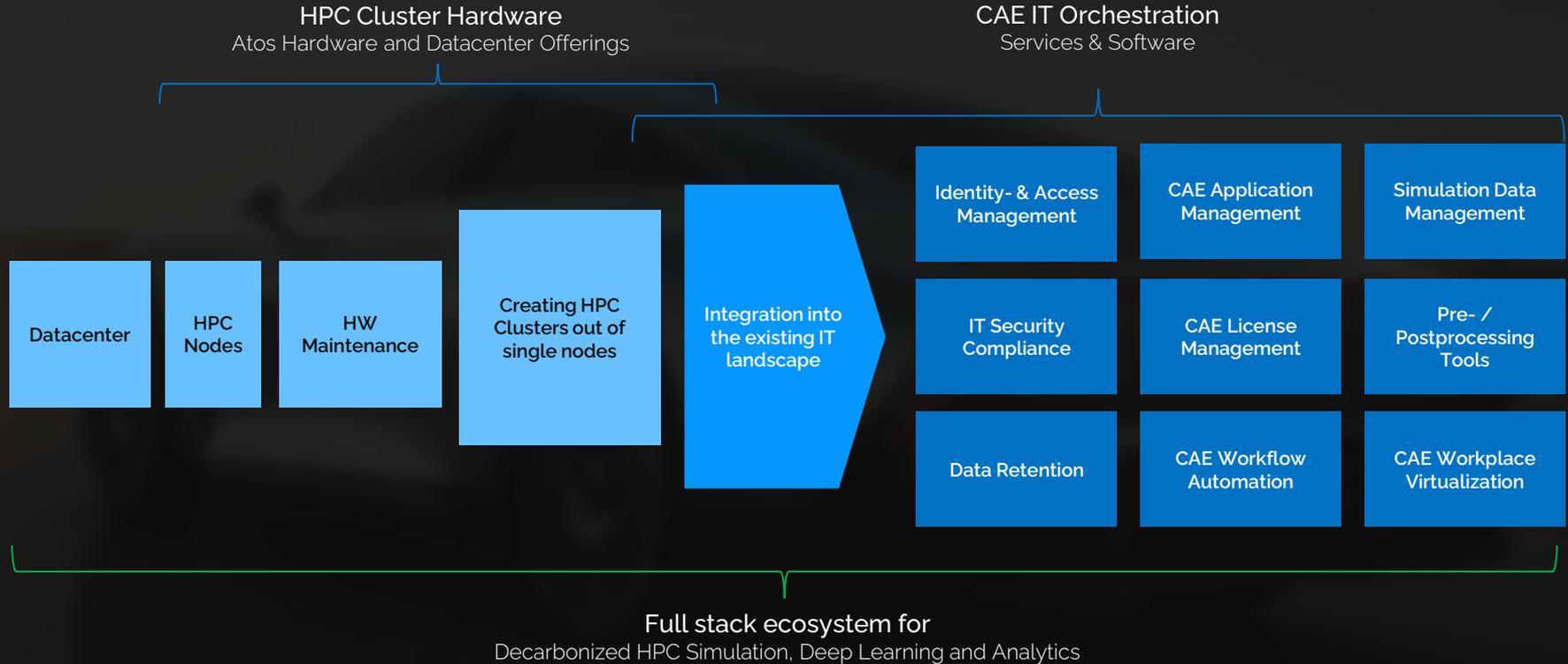
Supercomputer in the firing line over carbon footprint

"Computing power growing exponentially"

"Predictions for the next years are not so good"

An overview of the Engineering-IT landscape

Exploring areas for reducing carbon emissions



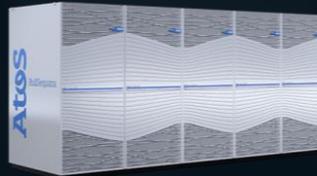
Sustainable and energy-efficient compute infrastructure

Continuously innovating to create low-carbon servers and data centers

BullSequana X is among the
greenest
supercomputers



72 patents around cooling
for HPC to achieve a
PUE < 1.02



Research on
Green Hydrogen
HPC



How to quantify and reduce the energy intensity of calculations?

Getting beyond consumption data per data center or server

Analyze
your HPC solver



```
# beo compute energy slurm4330 --stats
```

component.metric	[20170831T141153-20170831T141226]	trust	cost
esw5.energy	229.0 J	100.00 %	0.0000 e
isw1.energy	350.0 J	100.00 %	0.0000 e
isw3.energy	330.0 J	100.00 %	0.0000 e
node47.energy	3.9 kJ	100.00 %	0.0002 e
node50.energy	3.4 kJ	100.00 %	0.0001 e
sum(da[0-2],esw[1,5],isw[1,3],node[47,50]).energy	12.2 kJ		
min(da[0-2],esw[1,5],isw[1,3],node[47,50]).energy	0		
max(da[0-2],esw[1,5],isw[1,3],node[47,50]).energy	4.5 kJ		
avg(da[0-2],esw[1,5],isw[1,3],node[47,50]).energy	1.4 kJ		

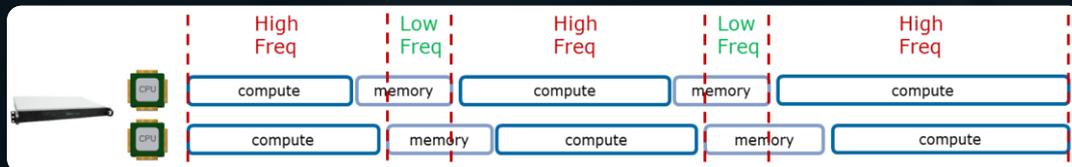
Discover
inefficiencies



```
# beo report energy slurm[4330,4339]
```

job	state	nodes.energy(slurm)	job.nodes.energy	job.switches.energy	job.disk_arrays.energy	job.energy	job.cost
slurm4330	CANCELLED by 0		7.2 kJ	909.0 J	0.0 J	7.8 kJ	0.0004 e
slurm4339	COMPLETED		54.9 kJ	4.1 kJ	0.0 J	58.9 kJ	0.0024 e

Dynamically reduce
clock speeds



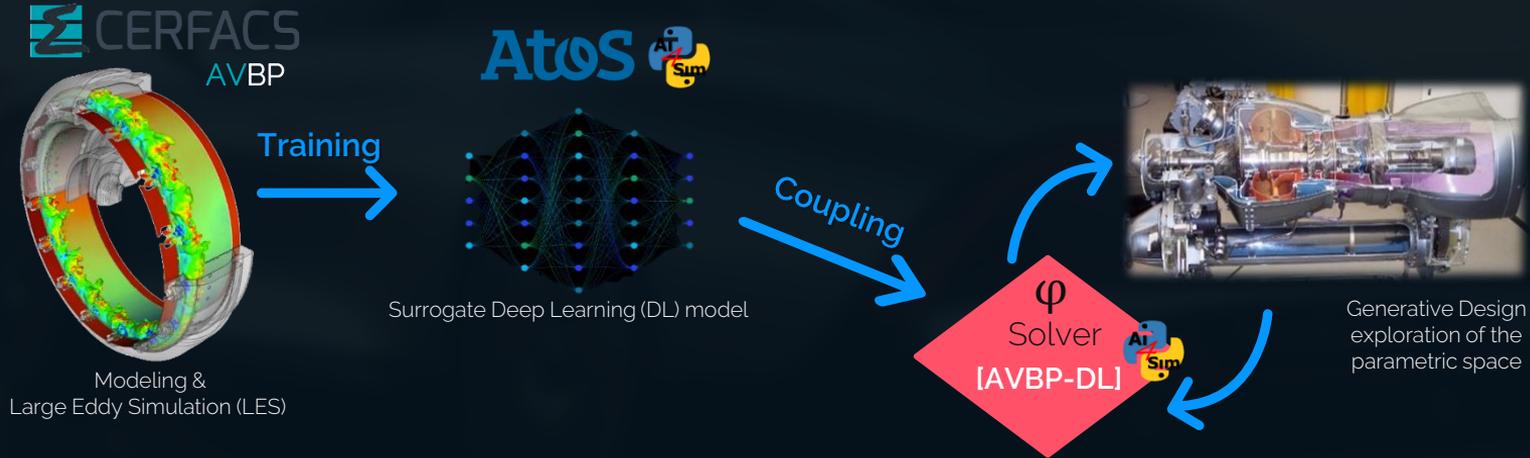
»» Higher efficiency and lower energy consumption ««

Leveraging physics-informed AI to make development more efficient

Go beyond numerical simulation limits

AI4Simulation

Example: AI4Sim powering the generative design of H2 combustion chambers



Precision: **Higher** Time To Solution: **5.5x** Speed up

Key take-aways

Leverage digital solutions for decarbonized product engineering

»»» For holistic CO₂ reduction, many aspects have to be considered «««

»»» There are some tools that enable sustainable design «««

»»» Atos combines expertise in Sustainability Consulting and IT «««

Let's find out together where the biggest carbon-reduction potential is!



Thank you!

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