
Climate Intelligence

Doing more for less with agility in uncertain times

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COLLABORATION with SIEMENS

Unlocking the power to
digitise water-energy systems

Our strategic collaboration with Siemens:

- Enables us to provide an easy-to-use **high fidelity process model**
- Is designed to reduce footprint with **minimal capital expenditure**
- Helps you make clear progress on your 2030 **sustainability goals**

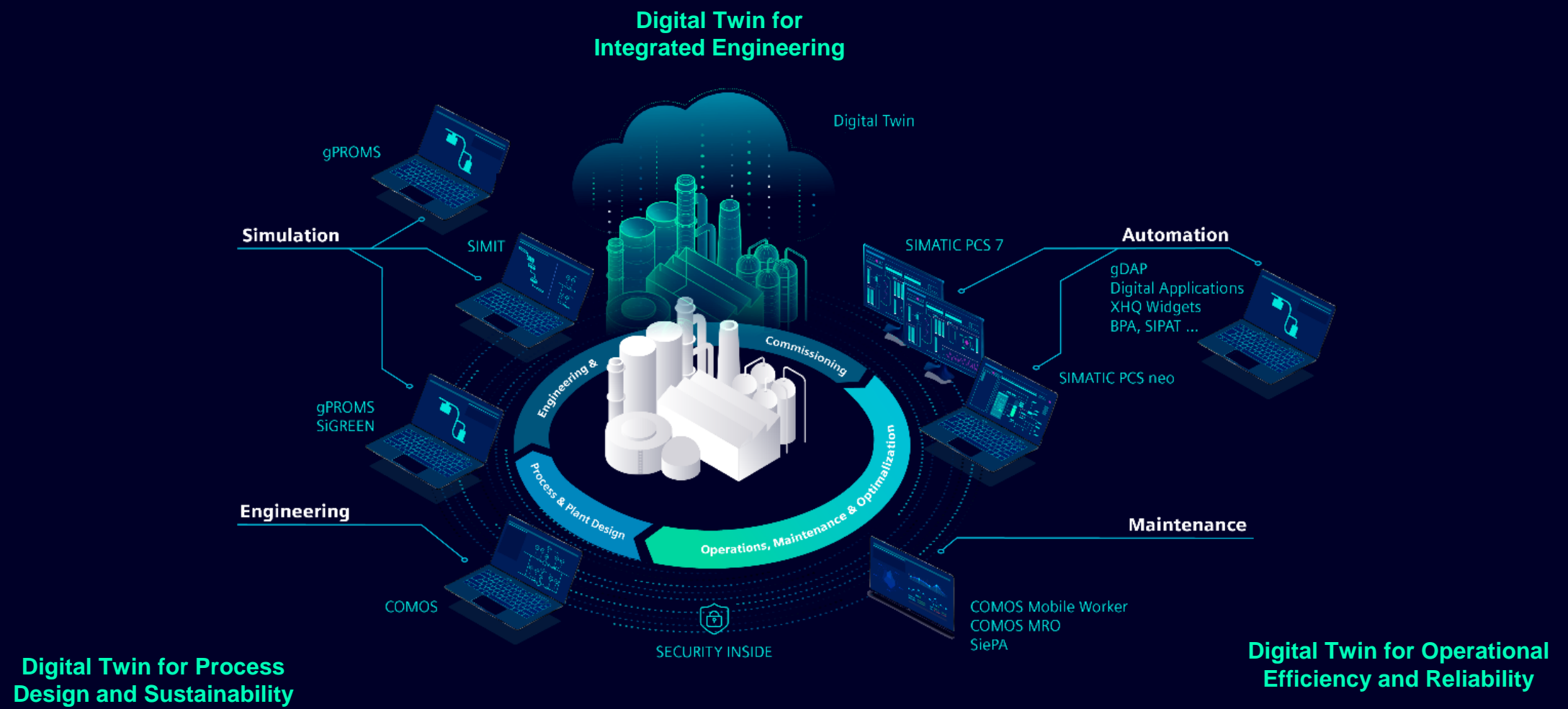
SIEMENS

Siemens is a technology company focused on industry, infrastructure, transport and healthcare.

“By combining the real and the digital worlds, we empower our customers to transform their industries and markets, helping them to transform the everyday for billions of people.”

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A Holistic Approach to the Digital Twin



ECOLAB - SIEMENS

A Partnership to deliver competitive advantage for our clients

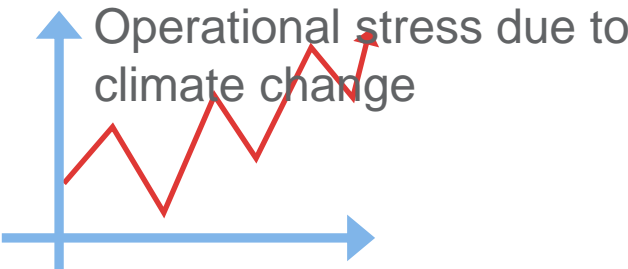
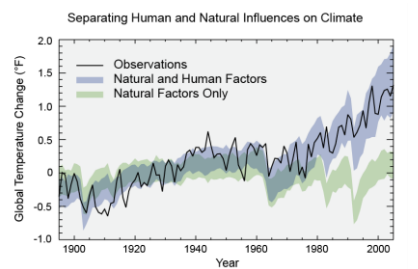
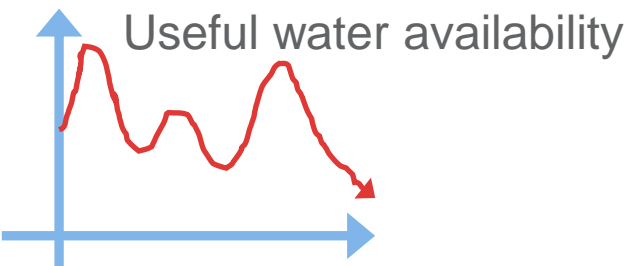
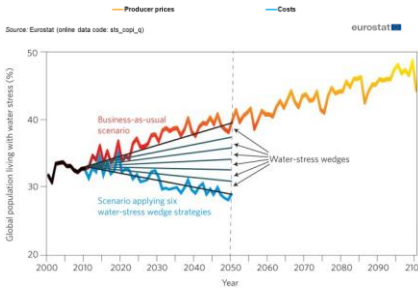
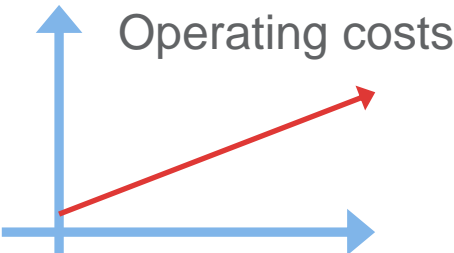
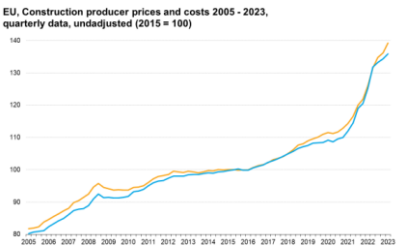
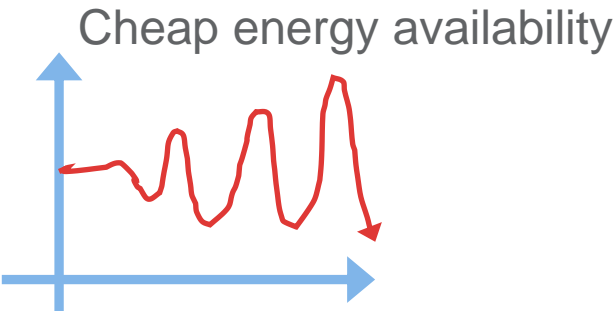
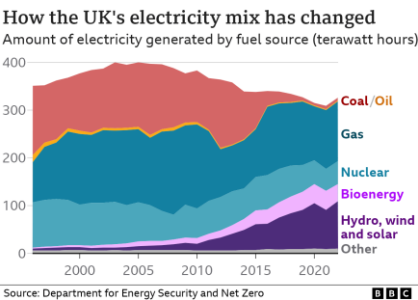
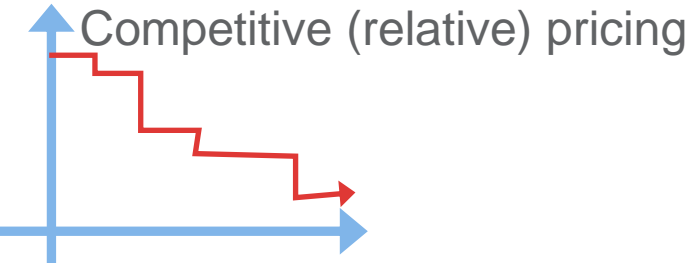
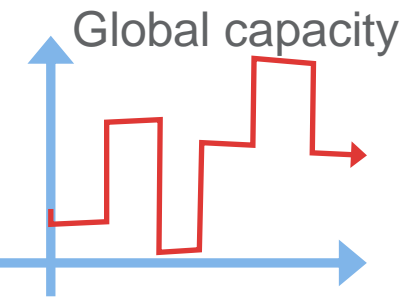
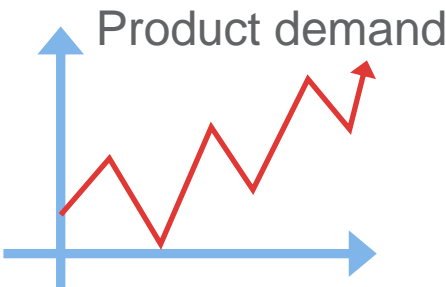
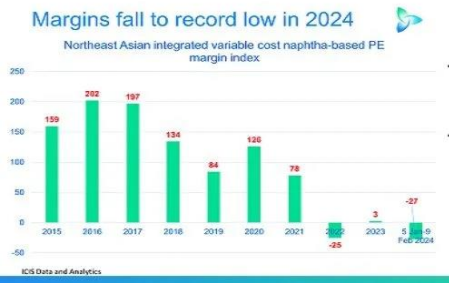
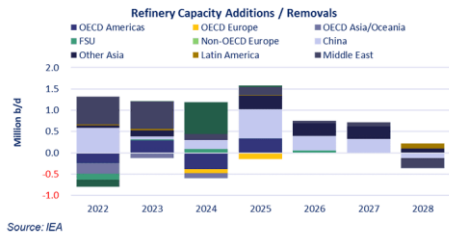
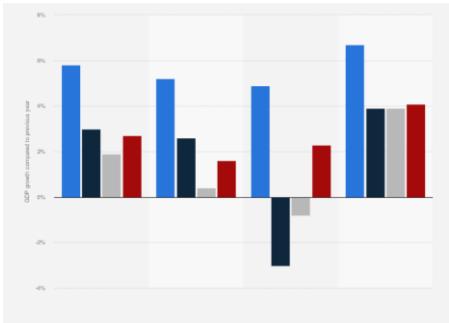
Climate Intelligence is a partnership solution from Ecolab-Siemens that combines **high-fidelity process models** with **domain expertise in water chemistry**.

This solution uniquely creates engineering-based relationships between **Water, Energy, Risk and Productivity** so that our clients can navigate their production plants towards a lower energy, water and emissions future, whilst boosting productivity and managing risks.

With an uncertain future, the refinery and petrochemical producers will need to operate their plants with greater agility, towards increasing automation and therefore less reliant on human real time decision making.

Outlook – what’s ahead

External factors



Outlook – what's ahead

Our industry is facing enormous ESG and transformational pressures.

Government policies – incentives are paid by fossil taxation

Consumer trends – our customers' brands are very visible

Keeping the lights on today

Energy transition technologies

Digital transformation to improve efficiency and productivity (reduced human dependency)

Huge investment needs for net zero

Limited quick wins to reduce emissions



What this means

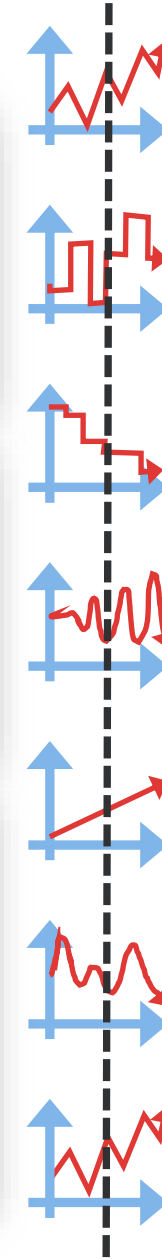
How uncertainty impacts plant profit!

At any time in the future, plant operations need to be able to operate with a lot more agility than in the past and with fewer resources and less emissions

Operating Margins highly volatile – what **OPEX** can you control, “flex” and reduce??

Frequency of **external factor** variability is increasing

Plant operating conditions need to respond more quickly to be profitable!



Product demand

Global capacity

Competitive (relative) pricing

Cheap energy availability

Operating costs

Useful water availability

Operational stress due to climate change

The agile operation

Thriving in a competitive world – survival is not enough

Production must be continuously optimised to respond to the dynamic external factors favourably

The role of human decision making is reducing as systems become increasingly complex and dynamic

Regardless of production rates, the plant must be optimised to make **more** product **for less** resources



Darwinism [Charles Darwin (1809–1882)]
...all species of organisms arise and develop through natural selection ... increase the individual's ability to **compete, survive, and reproduce**

Meaning of *thriving* in English

thriving

adjective

UK  /ˈθraɪ.vɪŋ/ US  /ˈθraɪ.vɪŋ/

C2

growing, developing, or being successful:

Start here. The unique role of water





A NEW CONCEPT

Water & Energy

Re-thinking the role of water

In industrial processes, from power generation, making beer, petrochemicals and refinery products, water is primarily a way of transferring energy.

What is heated, must be cooled.

Water has a high capacity to transfer energy



Heat



Cool



Move



of energy transfer is through water

Controlling water energy



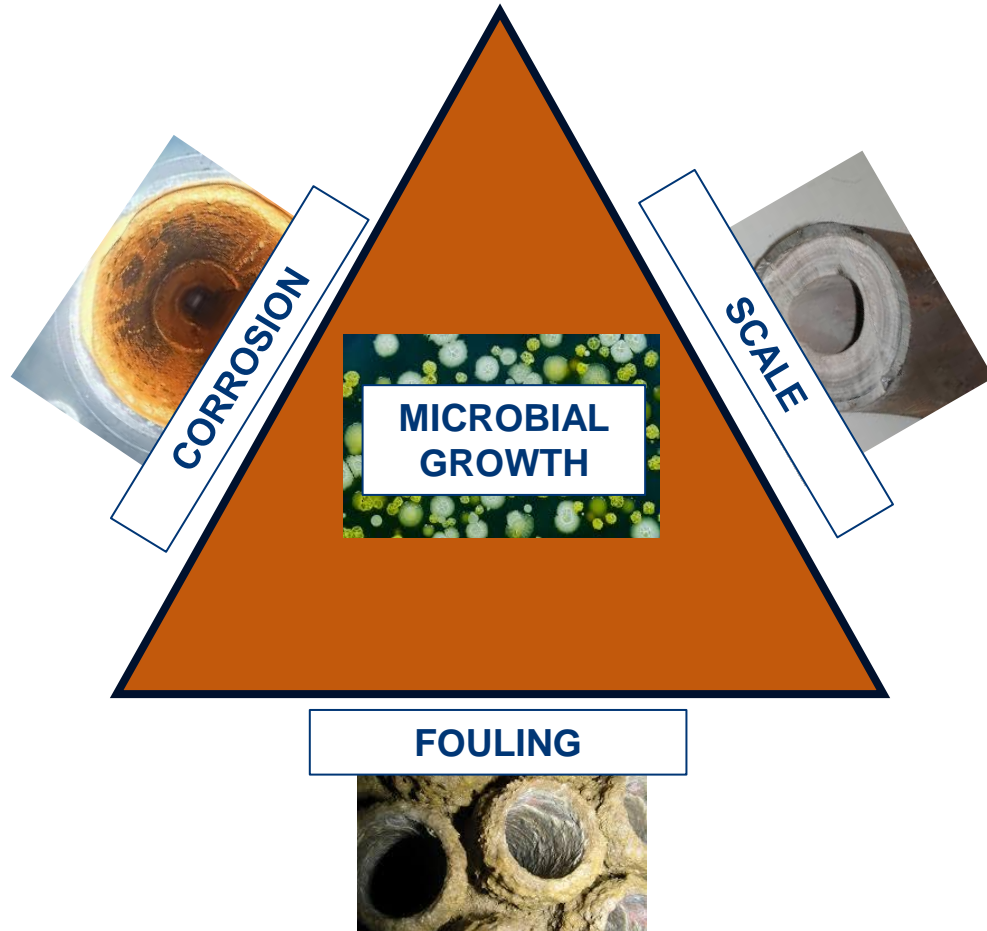
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Reduce energy



Cooling water – partial picture

Managing risks

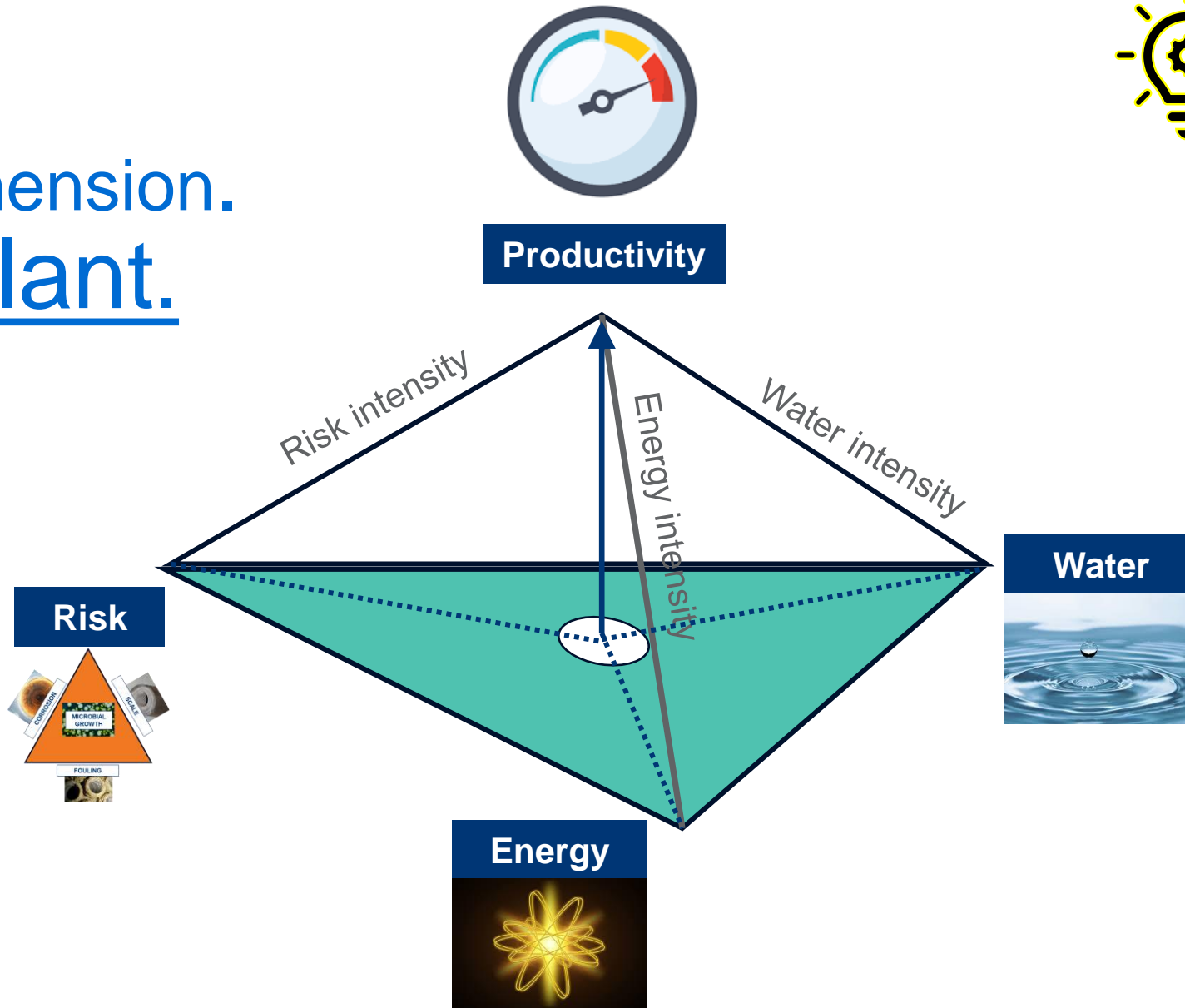


BUT: How do we incorporate ***YOUR*** ambitions:

- **reduced OPEX,**
- **less energy (less emissions),**
- **less water,**
- **Improved productivity**

.....all while managing these risks?

Introducing the productivity dimension. The agile plant.



*Doing more for less with
agility in uncertain times*

The Agile plant

Complex relationships, dynamic responses

“Risks” such as fouling, microbial, product contamination, cleanliness, scaling, corrosion...

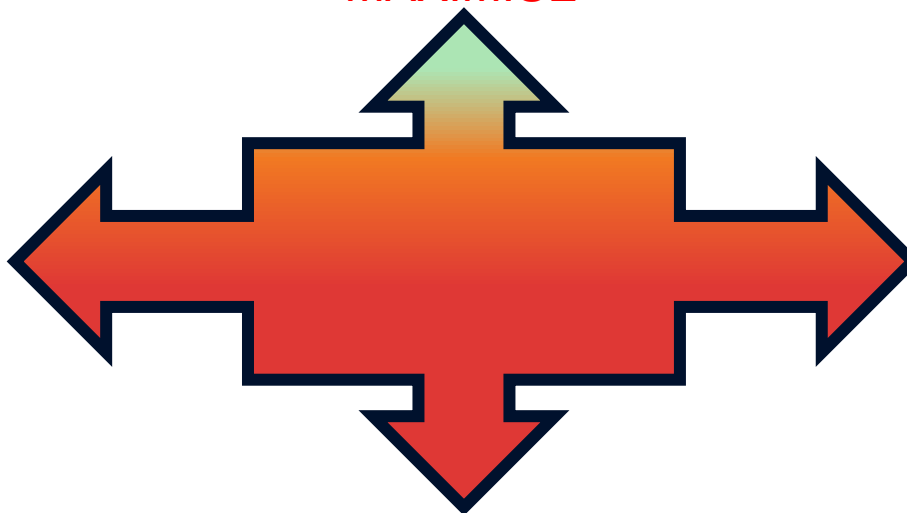


“Energy” efficiency can mean lower carbon and lower cost.



Productivity

MAXIMISE



REDUCE

Energy



There is a constant and dynamic tension between resources and production. Climate Intelligence creates unique insights to allow our clients to do more for less.

REDUCE

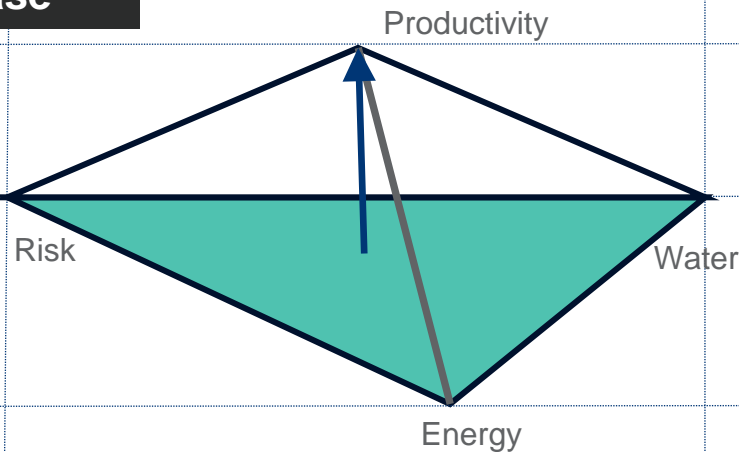
Water



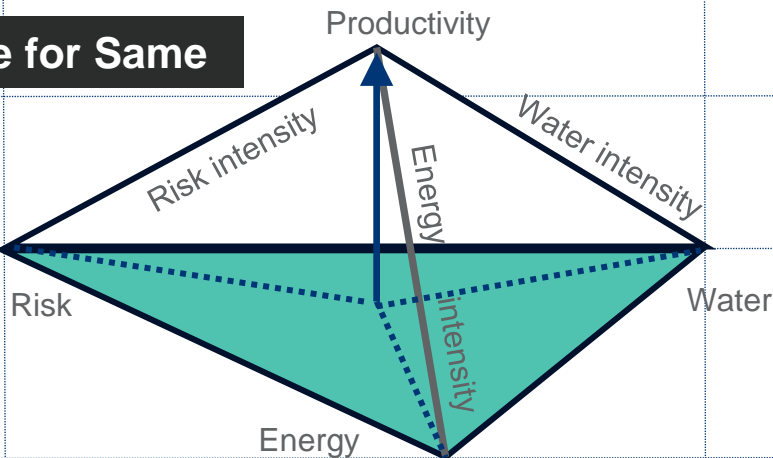
“Water” : Right place, right time, right amount and right quality to serve production...

Optimise! Optimise! Optimise! Optimise!

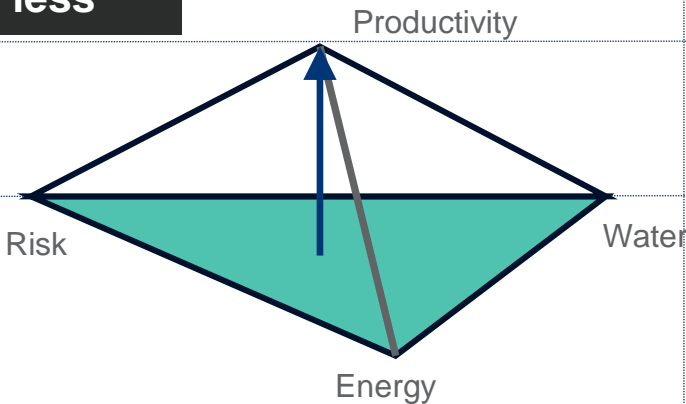
1. Base Case



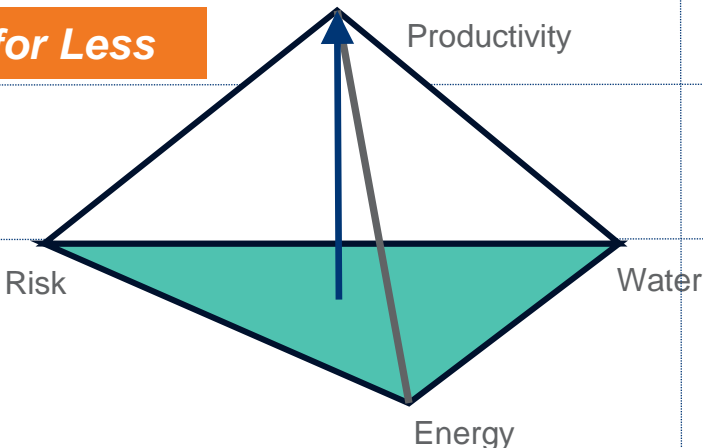
3. More for Same



2. Same for less



4. More for Less



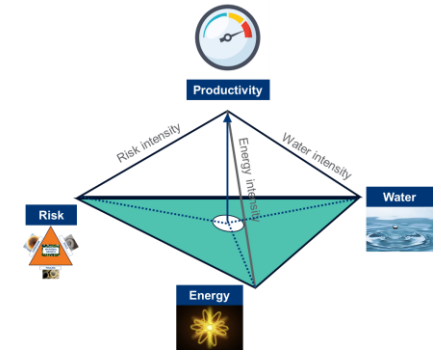
Results from Climate Intelligence application

New insights from the digital twin

Managing your water systems for productivity in an agile plant

What's in it for you?

Improved operating margin and productivity – doing more for less with agility!



Use Case		Opportunity identified (annualised)				
	Capacity	Opex savings	Energy	Emissions CO ₂ e	Productivity	Other
Refinery cooling	165kbd	2.48 M\$	41.9 GW	20.9 kT	-	-
Refinery steam/power	165kbd	2.80 M\$	-	38.5 kT	16GW ~ 7M\$	1MT water (reliability)
Ethylene Plant cooling	330kta	1.05 M\$	9.9 % reduction in EI		2TPH C2= ~ 15M\$	232kT water (reliability)
Ethylene Plant cooling	500kta	1.95 M\$	17.52 GW	8.3 kT	-	-

FINDINGS AND RESULTS

ETHYLENE PLANT AND REFINERY

Ethylene Plant – 100MW cooling tower & compressor cooling

Clever Cooling can improve efficiency and productivity (15% of emissions)

Live data required due to very variable conditions (climate, throughput)

CO₂ footprint reduction of cooling and compressors at set tph Ethylene

- 3.1% reduction in CO₂ emissions (gCO₂/MJ product)

9.9% reduction in CO₂ *intensity* to 9.2 g/MJ for cooling/compressor operation unlocks 2-4 tph additional ethylene at equal emissions (>\$ 25M)

Refinery – 100MWe CHP and 200tph steam system digital twin

Gas turbines and Steam generators plus Boilers and let down systems

Make-up water 390 m³/h: reliability audit on the BFW and steam quality

38,000 tons annual CO₂ emission reduction potential saving US\$3M fuel costs

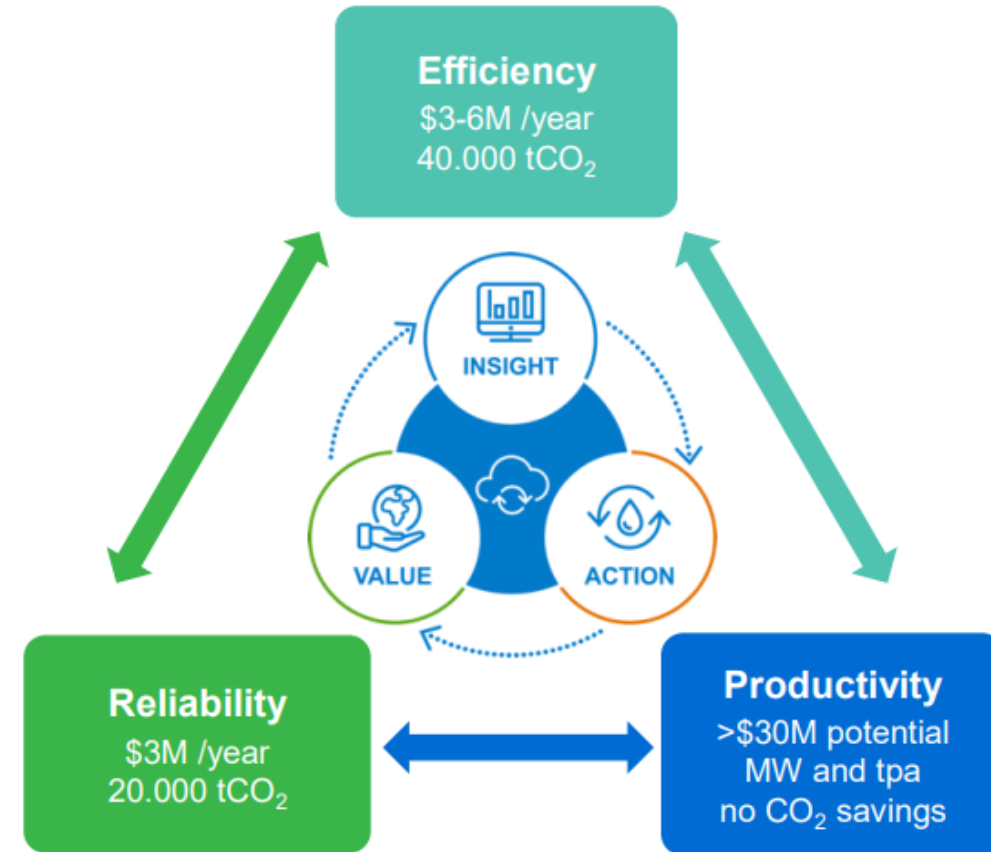
8MWe higher power output worth \$7M at equal carbon emissions

1 million m³/year BFW reduction potential identified

Condensate & BFW quality reliability projects worth \$3M and 20,000 tpa CO₂

Combining Cooling and Steam Systems

Flexibility: Carbon intensity vs. net emissions



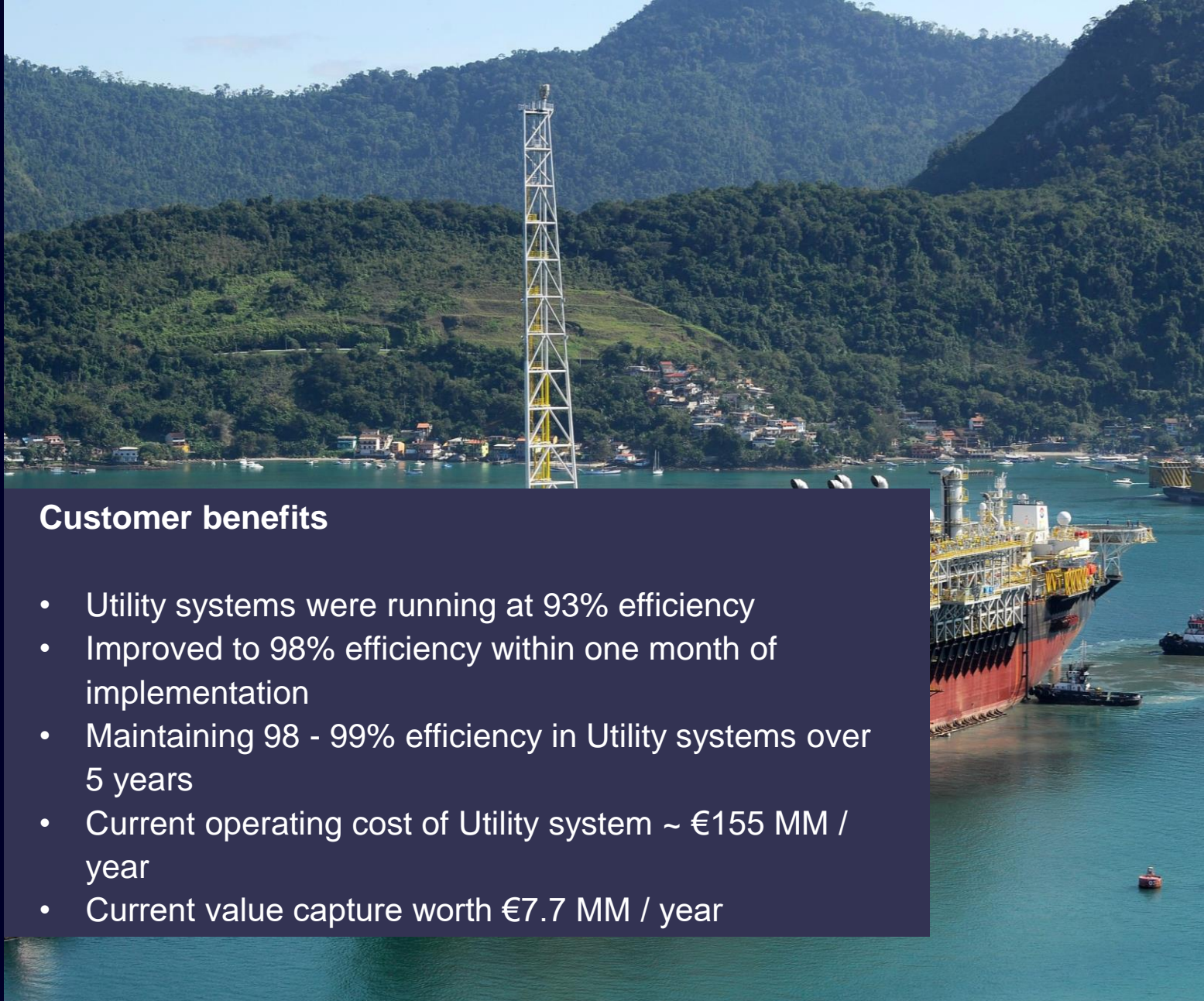
Galp, Portugal

Reduce energy consumption and CO2 emissions with gPROMS

- gPROMS Utilities energy optimization tool was implemented in 2019
- The on-line Advisor monitors Galp's energy use hour-by-hour and gives our operators clear instructions on how to change operation to reduce costs. Numerous dashboards are deployed across 3 control rooms and utility plant to make information easily accessible to operators.

Customer benefits

- Utility systems were running at 93% efficiency
- Improved to 98% efficiency within one month of implementation
- Maintaining 98 - 99% efficiency in Utility systems over 5 years
- Current operating cost of Utility system ~ €155 MM / year
- Current value capture worth €7.7 MM / year





***REAL
CHANGE
starts today***

Climate Intelligence
Powered by **ECOLAB3D™**

Start now. Start with water

***Smart water,
fast results***