AX GROUP

“we fight energy waste”

ACC User Group

Air Cooled Condenser Users Group

2024 ANNUAL CONFERENCE

July 23-25, 2024

University of East London
(University Square Stratford)

"Can We Achieve More Performance with Optimized Resources?"

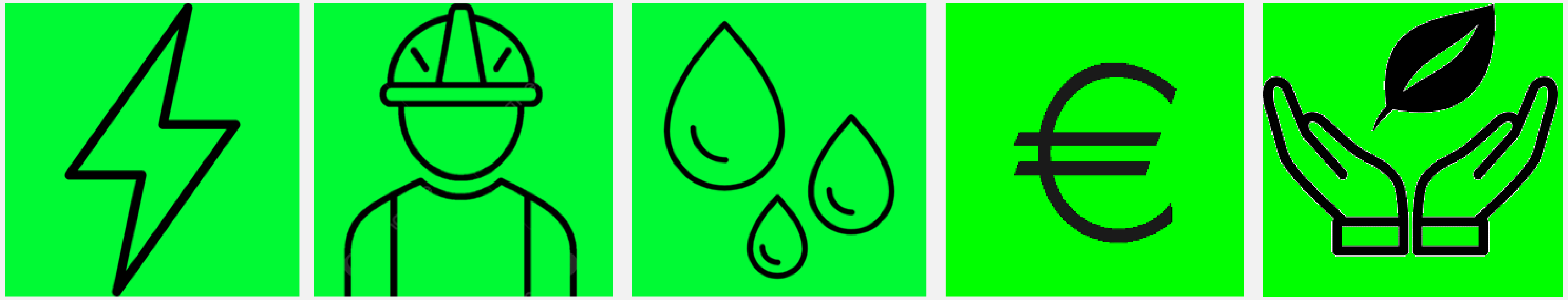
AX GROUP at a glance

Resources preservation at the very heart of what we do/what we are

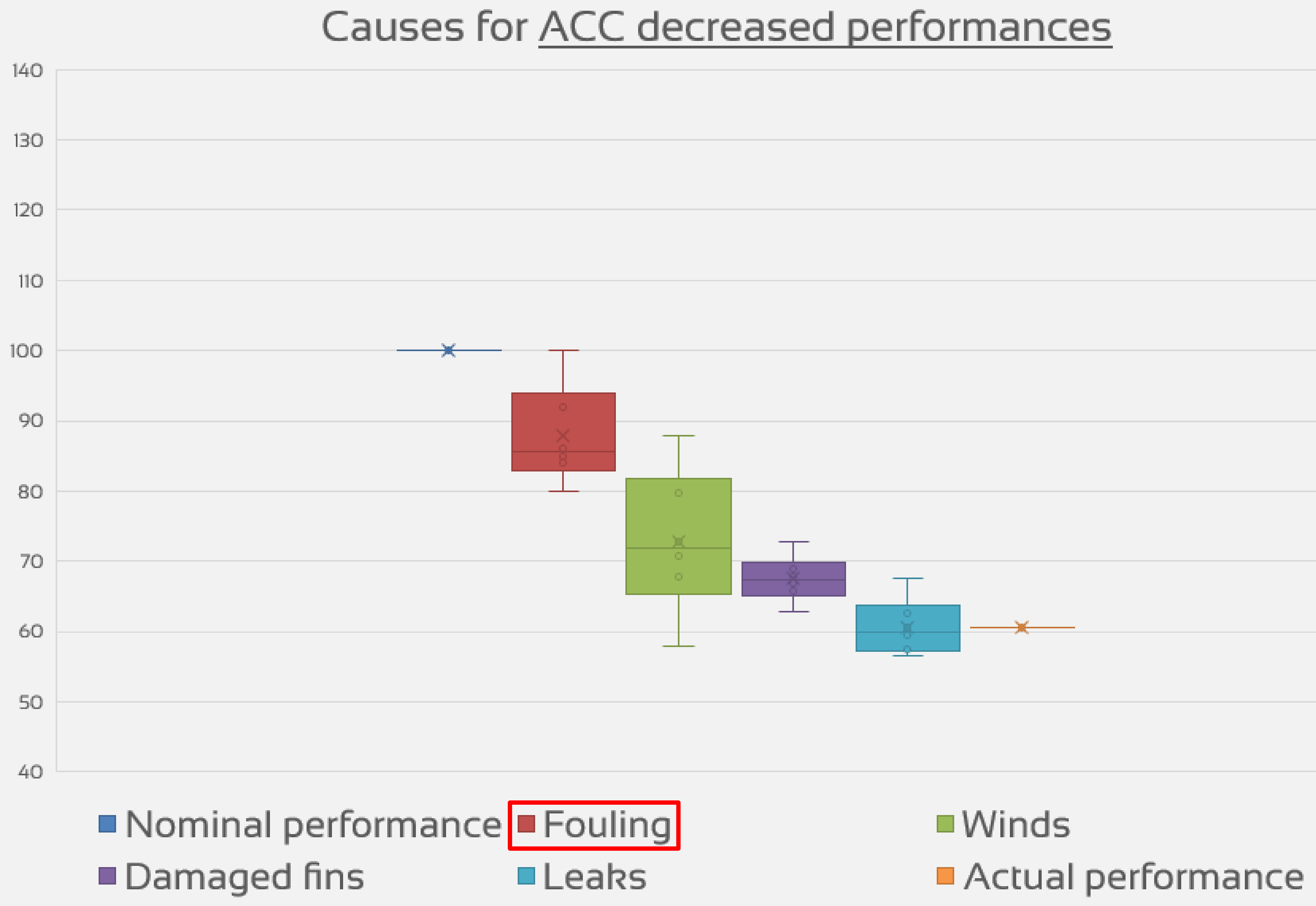
Greenfactory featuring
-rainwater harvesting system,
-22 kW solar panel installation
-low-energy heating system,
-high-performance workplace

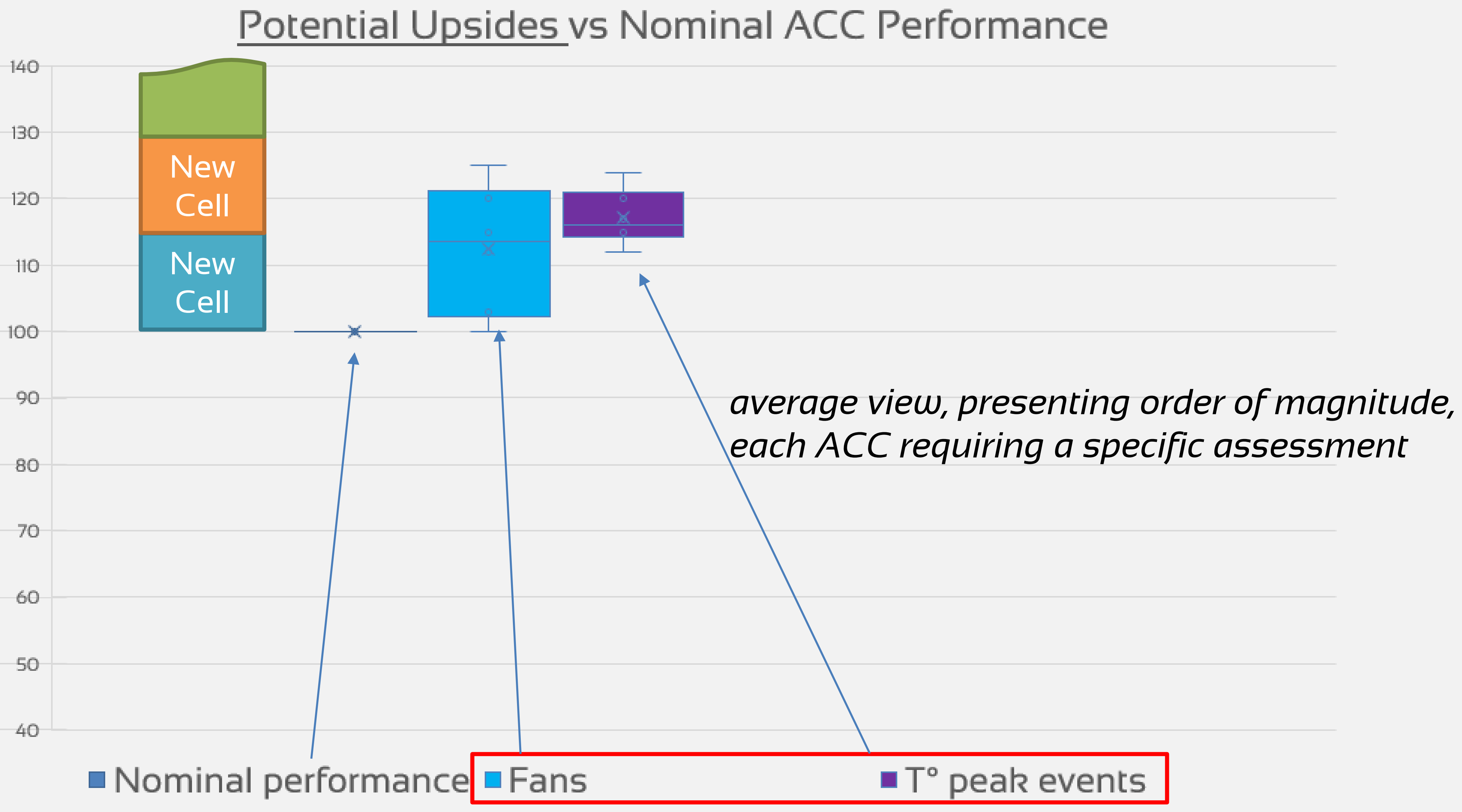
Introduction

The presentation aims to identify the causes of decreased performance and potential upsides in Air Cool Condensers (ACC), and discusses various strategies that users/operators can activate to improve performance while optimizing the overall resources required, including human ones.



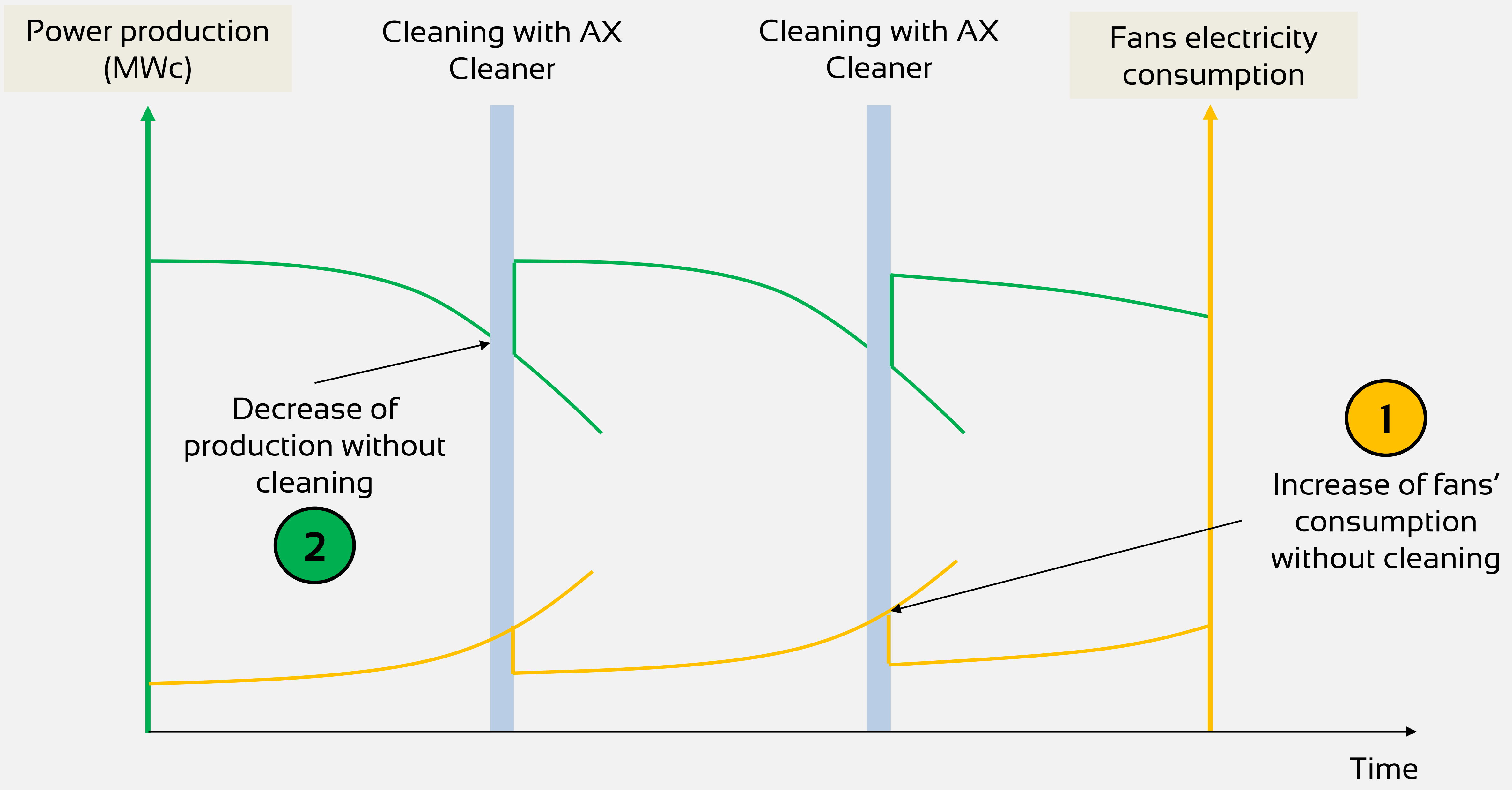
Causes for decreased performance & potential upsides to ACC performance





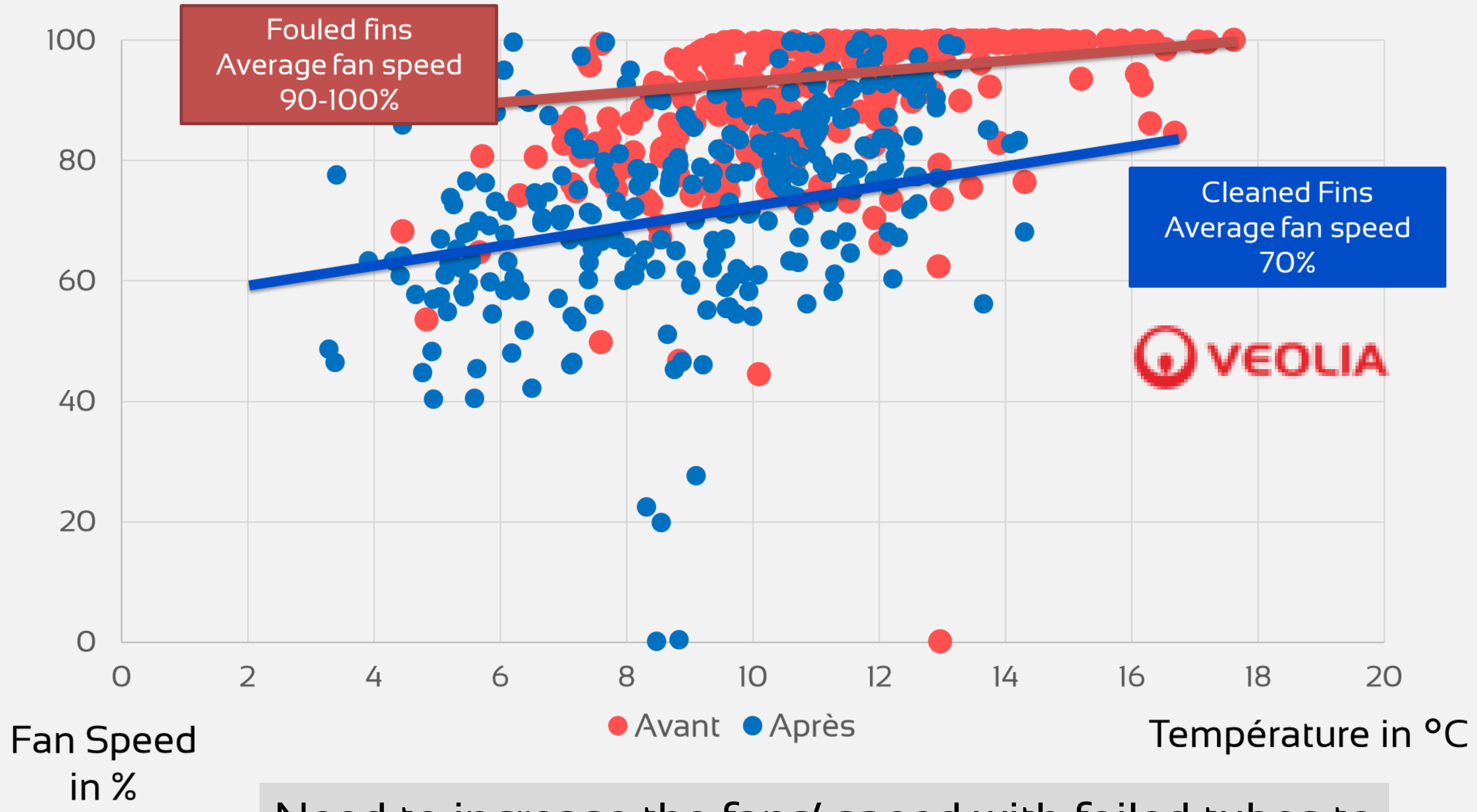
Our presentation will cover strategies to mitigate the key issues of fouling, t° peak events and fans
[focus on **airflow** (under)performances]

Consequences of fouling over ACC performances



Fouling - impact on Fans electricity consumption 1

Electrical power = speed x torque

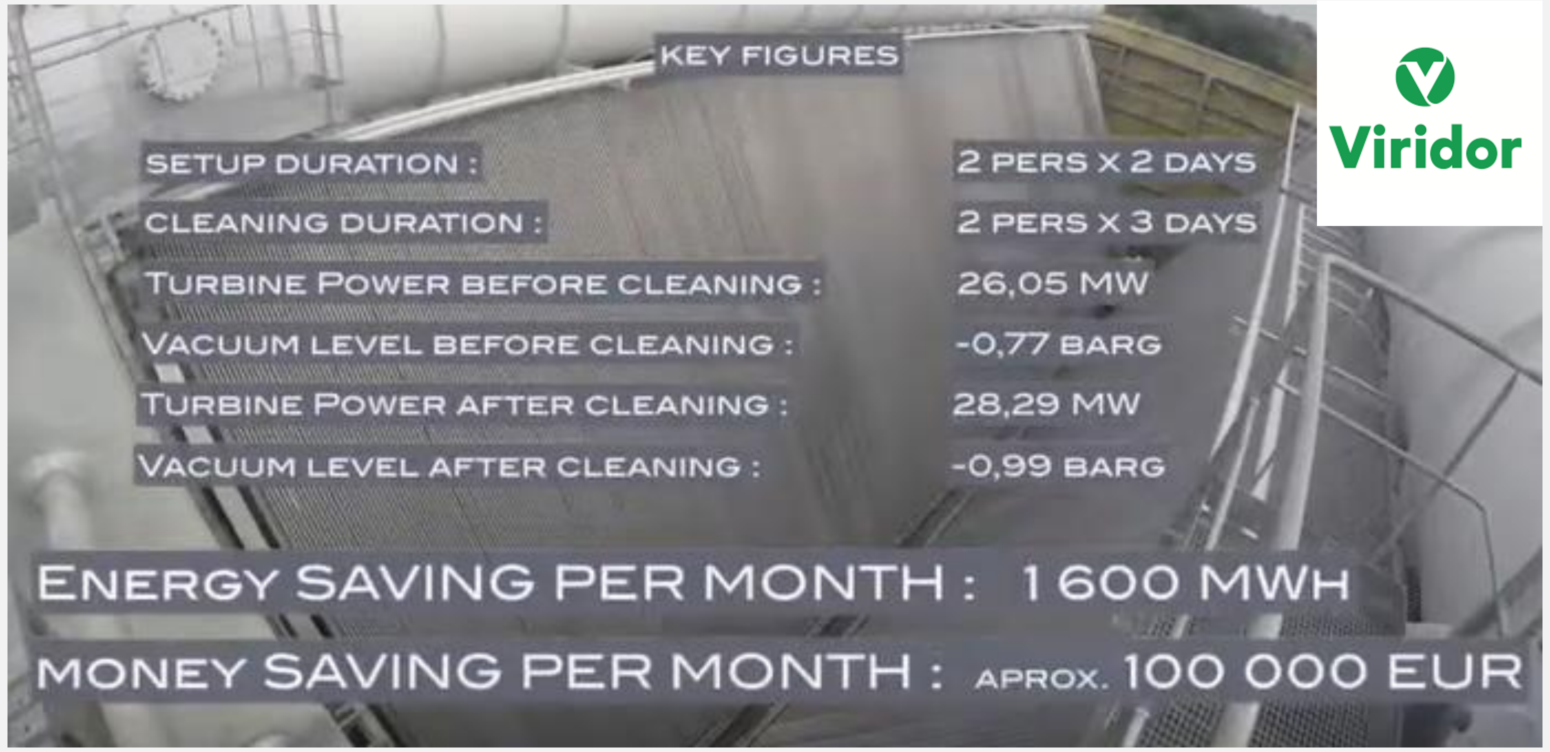


Need to increase the fans' speed with foiled tubes to maintain the ACC performance

Current increase due to higher resistive torque (increase of hydrostatic pressure in the ACC)

Fouling - impact on reduced electricity generation 2

Soiling prevents nominal condensing levels, hence impacting the electricity production



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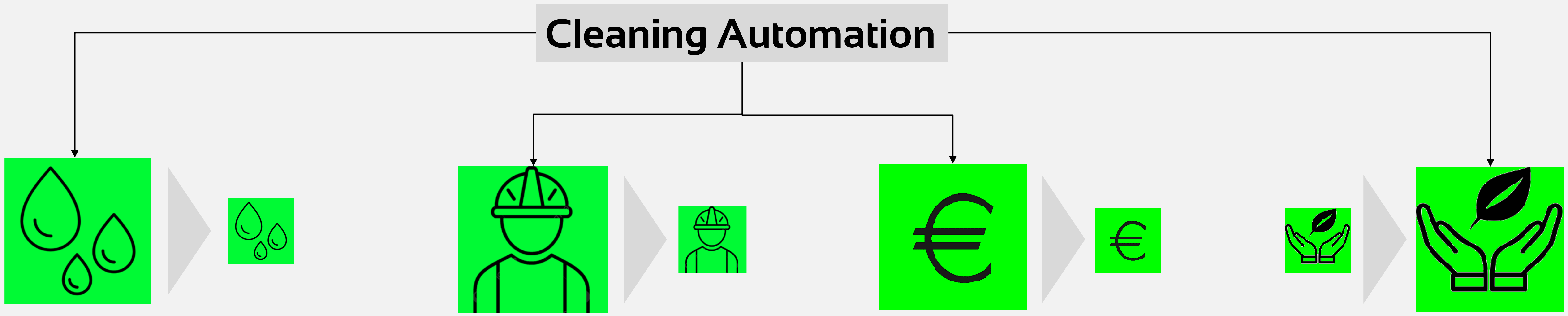
Fouling – how to mitigate while optimizing resources?



<u>Water consumption</u>

- optimally designed automatic cleaning systems reduce water usage compared to manual and semi automatic cleaning operations (up to 4 times less)
- allows to implement rainwater and cleaning water recycling systems permanently installed on sites

<u>Workforce</u>

- Fewer human resources to deploy (/2), and for reduced times (no (des)installation)
- Increased safety for the technicians

<u>Cleaning system LCC</u>

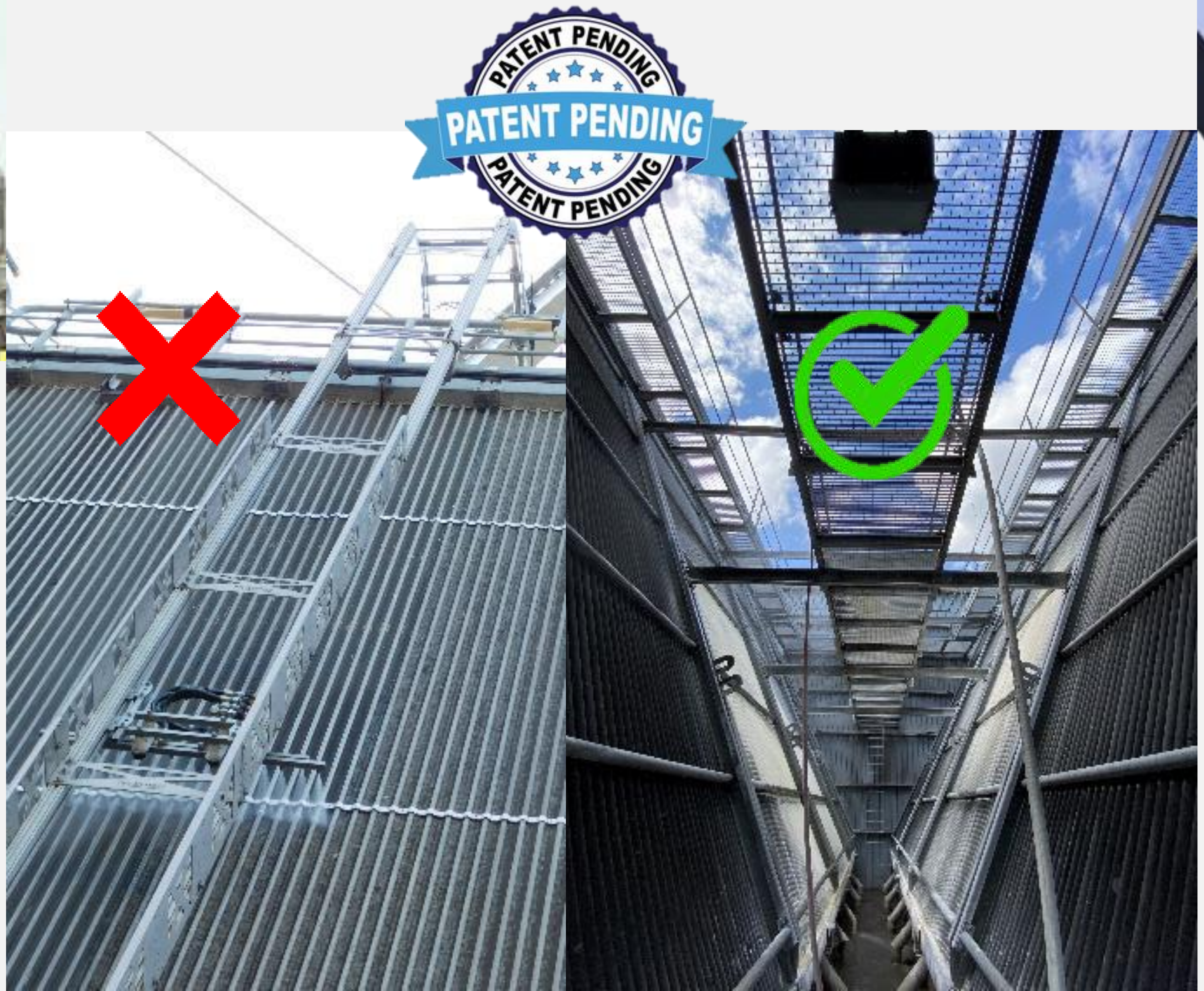
- "Clean when needed" – sensors on fans to determine the right time for cleaning - (up to localized cleaning)

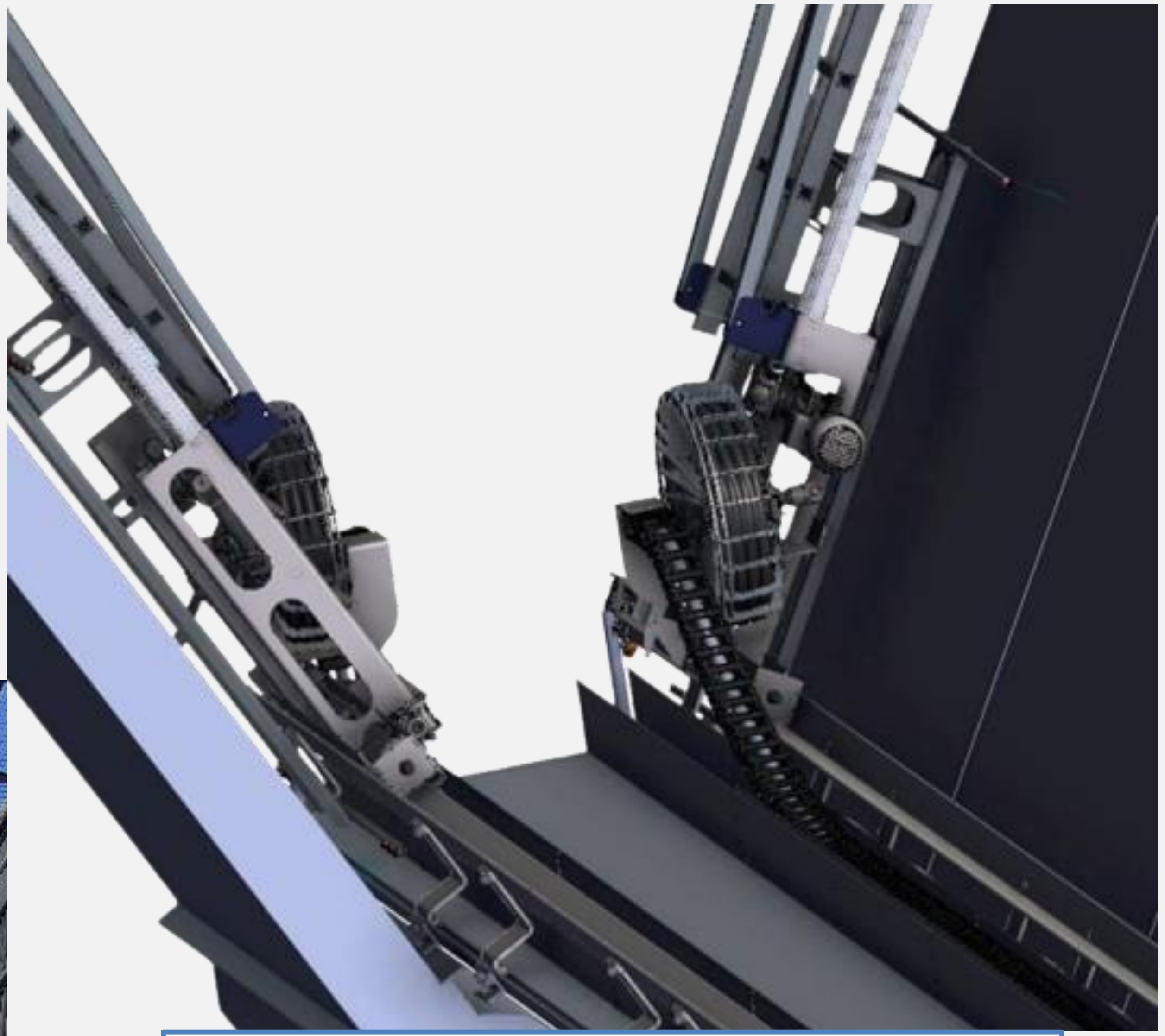
<u>Ground pollution</u>

- "closed circuit" to avoid fouling in the floor

Fouling – how to mitigate while optimizing resources?

All ACC & ACHE Cleaning





DC monitored Cleaning Systems

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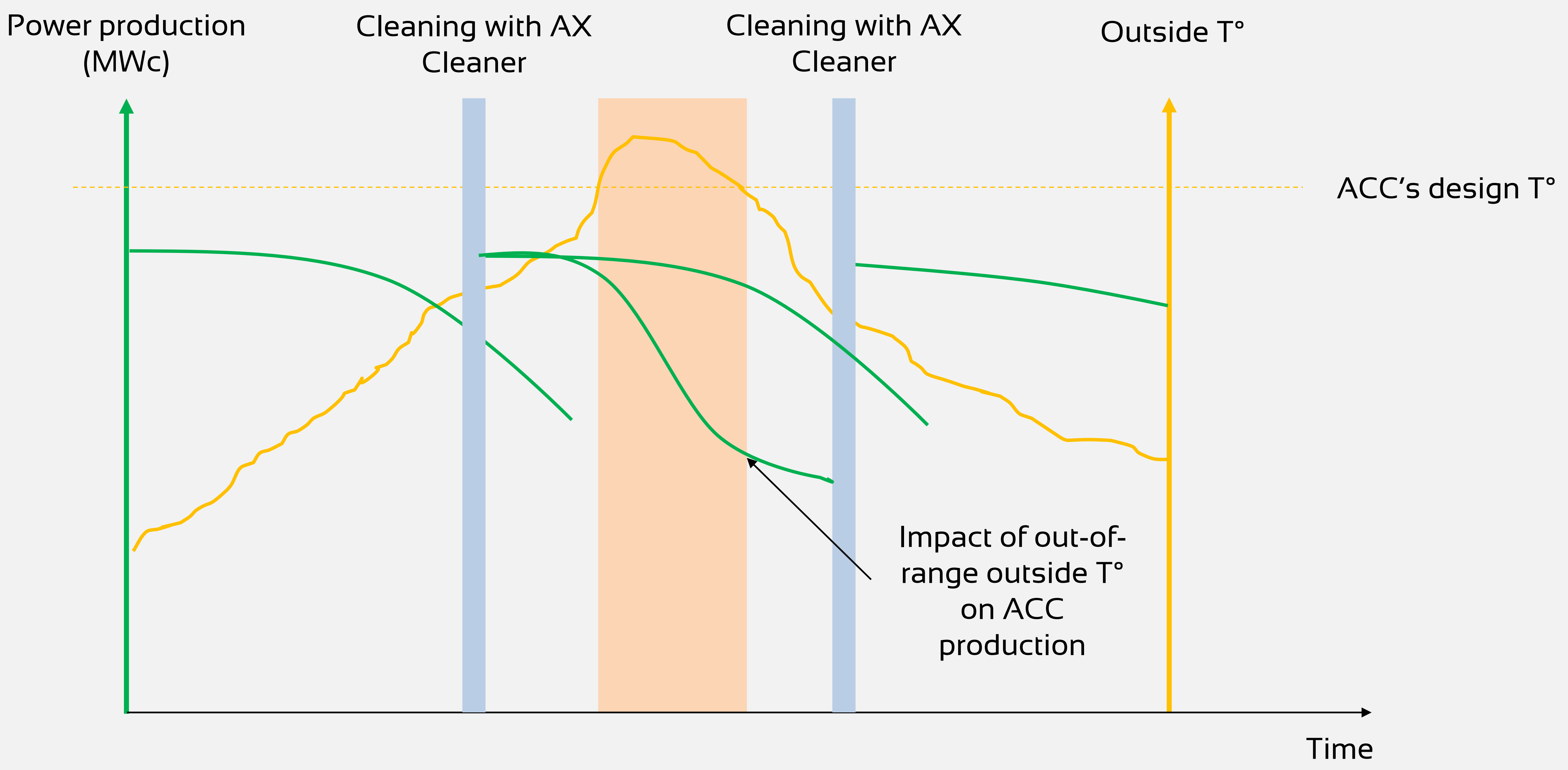
Consequences of T° peak events over ACC performance



>Steam bypass to avoid exceeding design T° results in an output drop
Objective: Avoid temporary shutdown of the plant while maintaining nominal current production

T° peak events – how to mitigate while optimizing resources?

Fogging

Principle: seek thermodynamic equilibrium by injecting fine droplets into a dry environment > change from liquid to gaseous state, which absorbs calories (adiabatic expansion) - if water does not change state, nothing happens, cools at the margin, no thermodynamic effect > water waste if cleaning system is used to cool down the heat exchangers..!

It is tempting to say "peak temperature, let's switch on the automatic cleaning system to cool down", but that's a false good idea

Brownfield/Existing Power Plant (>3 to 5Y)

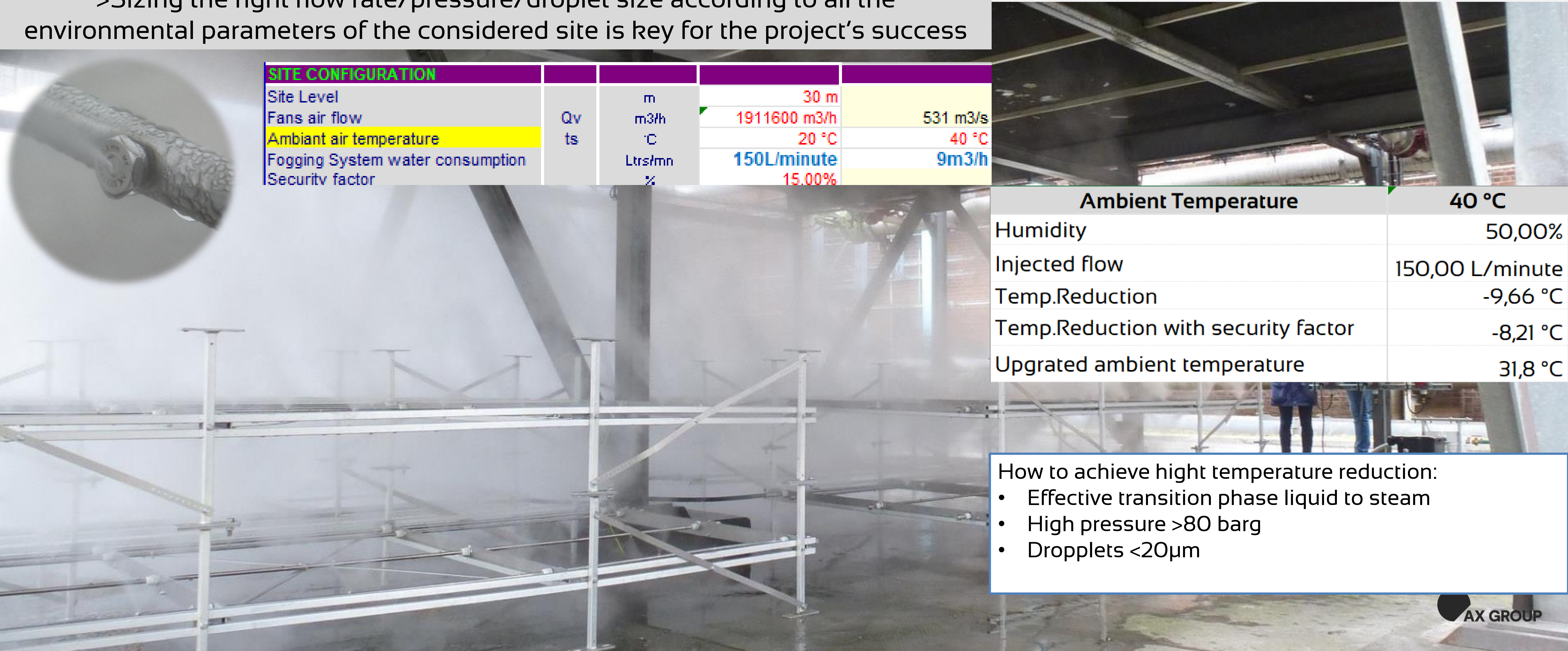
Maintain 100% production when the design of the power station would not allow this target to be reached, given the outside temperature (and humidity) conditions: automatic/monitored activation

Greenfield/New Power Plant

Raw material in ACC construction and footprint: sizing the ACC at minimum to reduce construction cost and raw material, while improving adiabatic air reduction with fogging

T° peak events – how to mitigate while optimizing resources?

>Sizing the right flow rate/pressure/droplet size according to all the environmental parameters of the considered site is key for the project's success



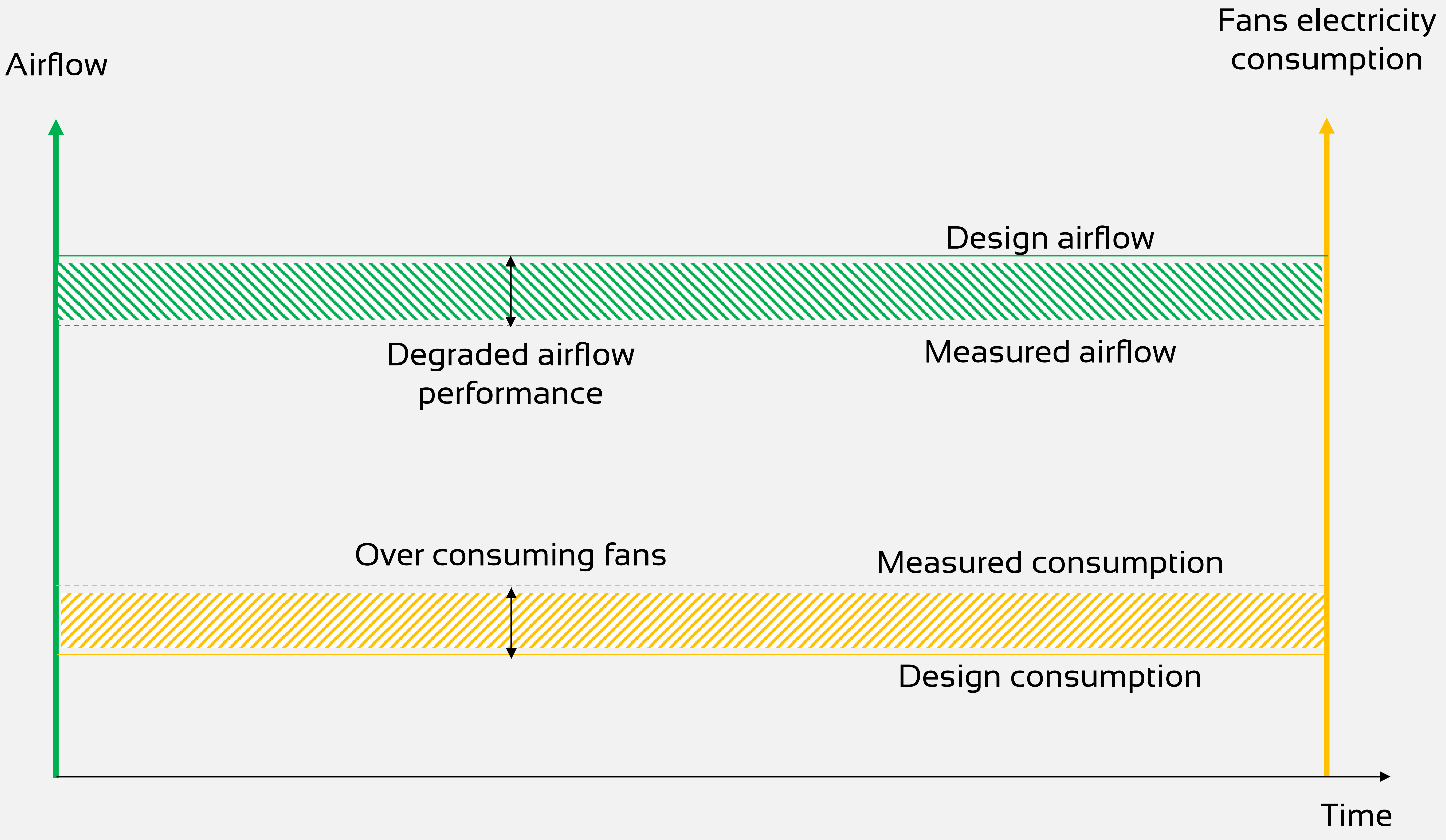
SITE CONFIGURATION				
Site Level		m	30 m	
Fans air flow	Qv	m3/h	1911600 m3/h	531 m3/s
Ambiant air temperature	ts	°C	20 °C	40 °C
Fogging System water consumption		Ltrs/mn	150L/minute	9m3/h
Security factor		%	15.00%	

Ambient Temperature	40 °C
Humidity	50,00%
Injected flow	150,00 L/minute
Temp.Reduction	-9,66 °C
Temp.Reduction with security factor	-8,21 °C
Upgrated ambient temperature	31,8 °C

How to achieve hight temperature reduction:

- Effective transition phase liquid to steam
- High pressure >80 barg
- Dropplets <20µm

Fans – impacts on electricity demand and ACC performances



When measured, design levels of airflow (hence condenser performances) and fans power consumption often differ from design specs, <u>due to non optimized airflow distribution</u>

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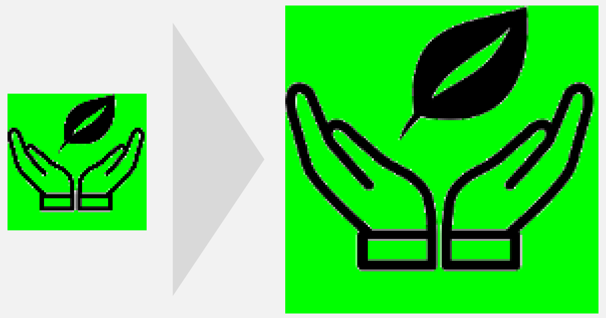
Fans – how to mitigate while minimizing resources?

Upgrading the existing fans allows either…

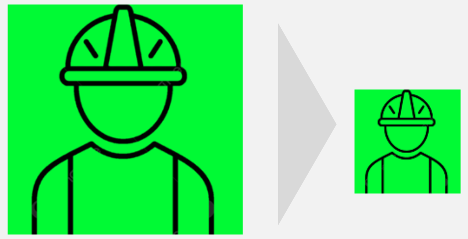
Same airflow & decreased consumption (up to -25%)

Same consumption & higher airflow (up to + 20%)

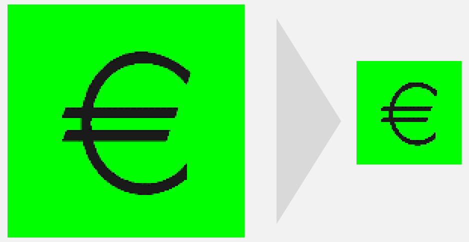


…While requiring:

-minimum on-site work vs full replacement of fans



-minimum (and possibly zero) capex (incentive on savings/additional power generation)



CONCLUSION

Cleaning (esp automatized), Fogging and Upgrading Fans are significant and complementary drivers for an increased ACC performance, while enabling to optimize as most as possible necessary resources for their implementation on site.

Thank you for your attention! Questions?

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