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Spare Parts Pooling Optimization with a PBL Approach

LEONARDO AIRCRAFT

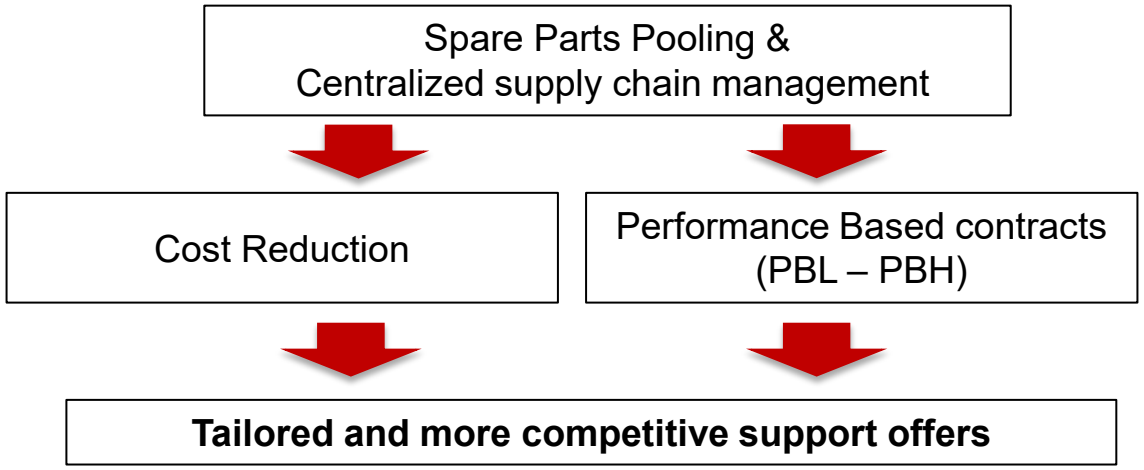
14th, May 2024

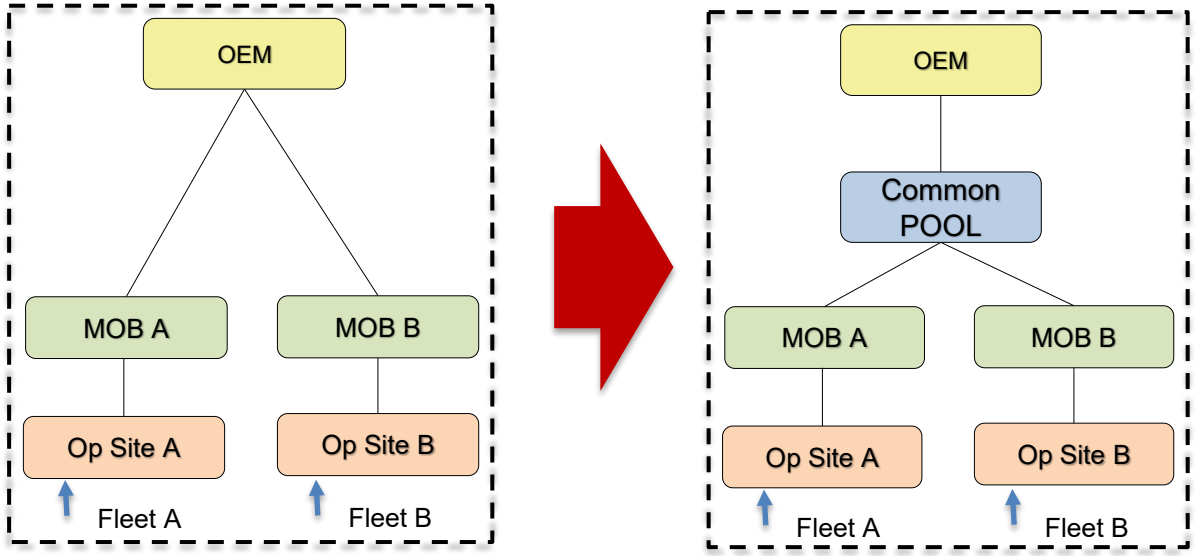
Agenda

- Spare parts Pooling
  - Overview
  - S/N exchange service
  - Affecting conditions
- Spares support analysis: PBL-based approach
- Case Study

Spare parts Pooling - Overview

Logistic support concept introduced in LAD in 2008:





Pool evolution through years:

2008 **2024**

Pool access for 2 Customers:

- Total served fleet: 6 A/Cs
- Overall RoE ≈ 1000 FH/Year

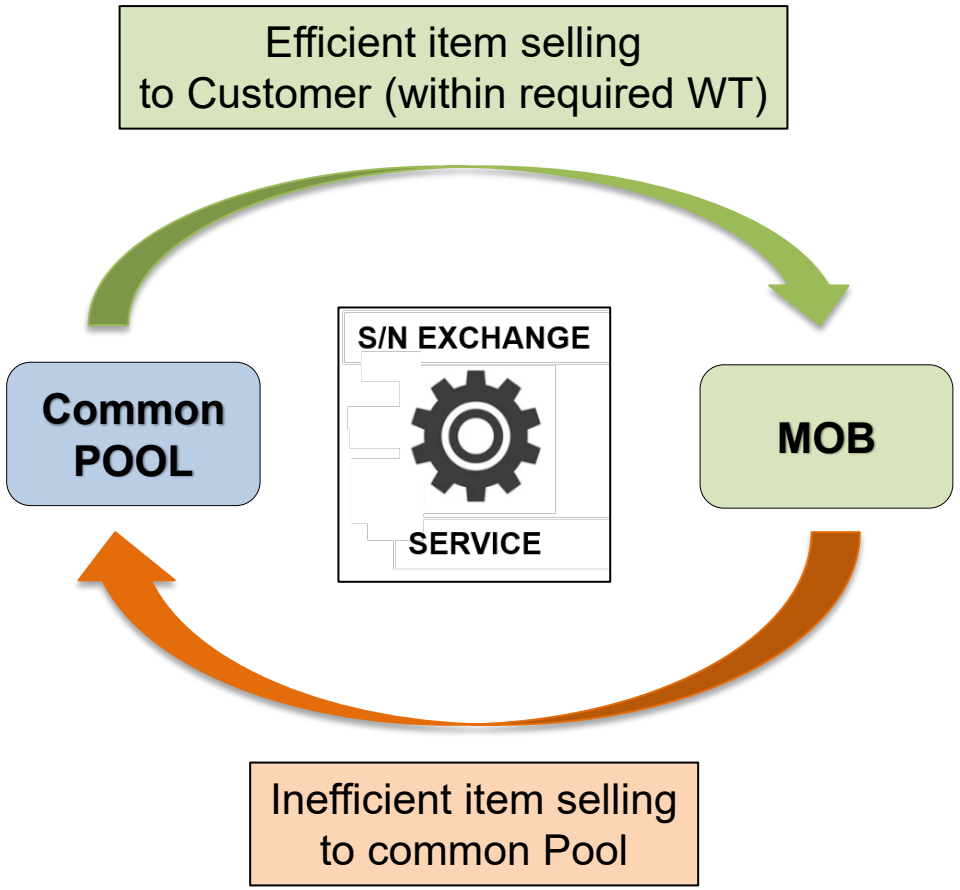
Pool access for 10 Customers:

- Total served fleet: 40 A/Cs
- Overall RoE ≈ 12000 FH/Year

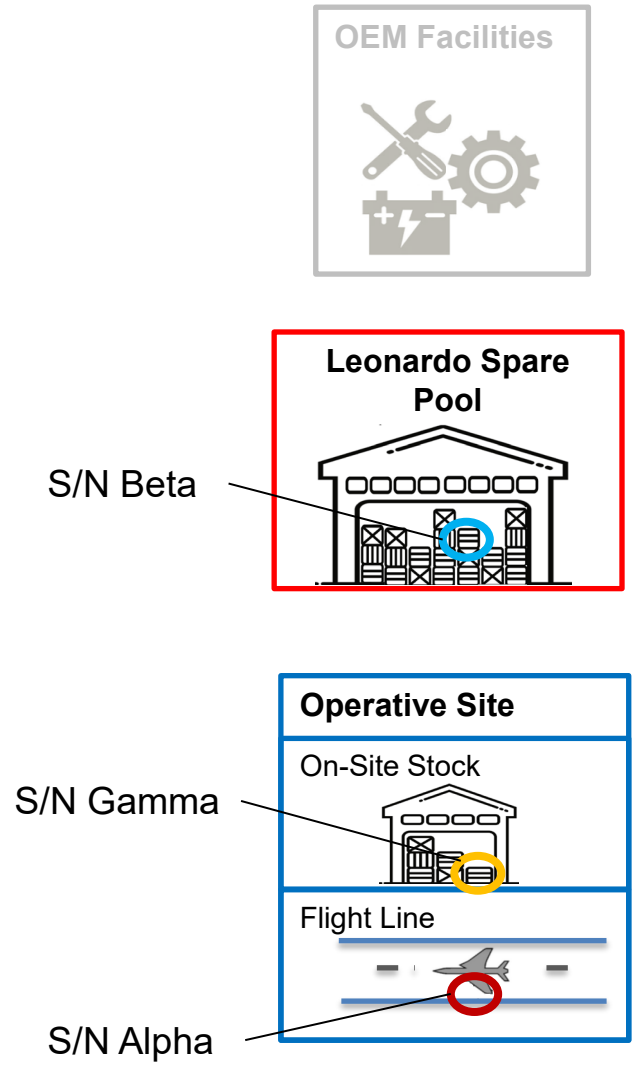
S/N exchange service

Service contract stipulated with the Customer:

- Triggers when any maintenance event involving item replacements occurs (faults, life limit events)
- Spare delivery from Pool to Customer occurring within a Waiting Time, established by contract
- Implies items property exchange of items between LAD and Customer (inefficient item selling does not apply for discard events)



S/N exchange service



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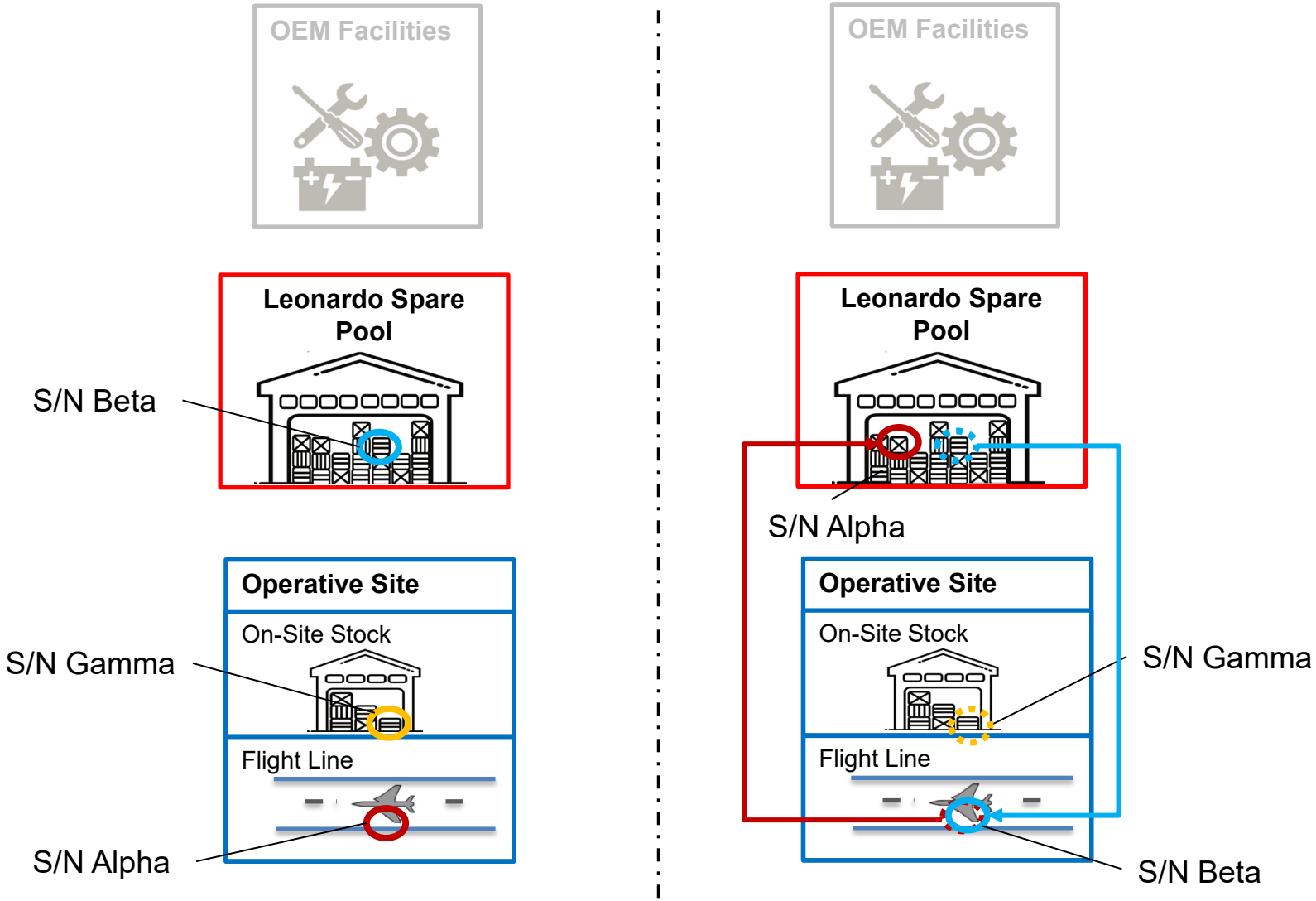

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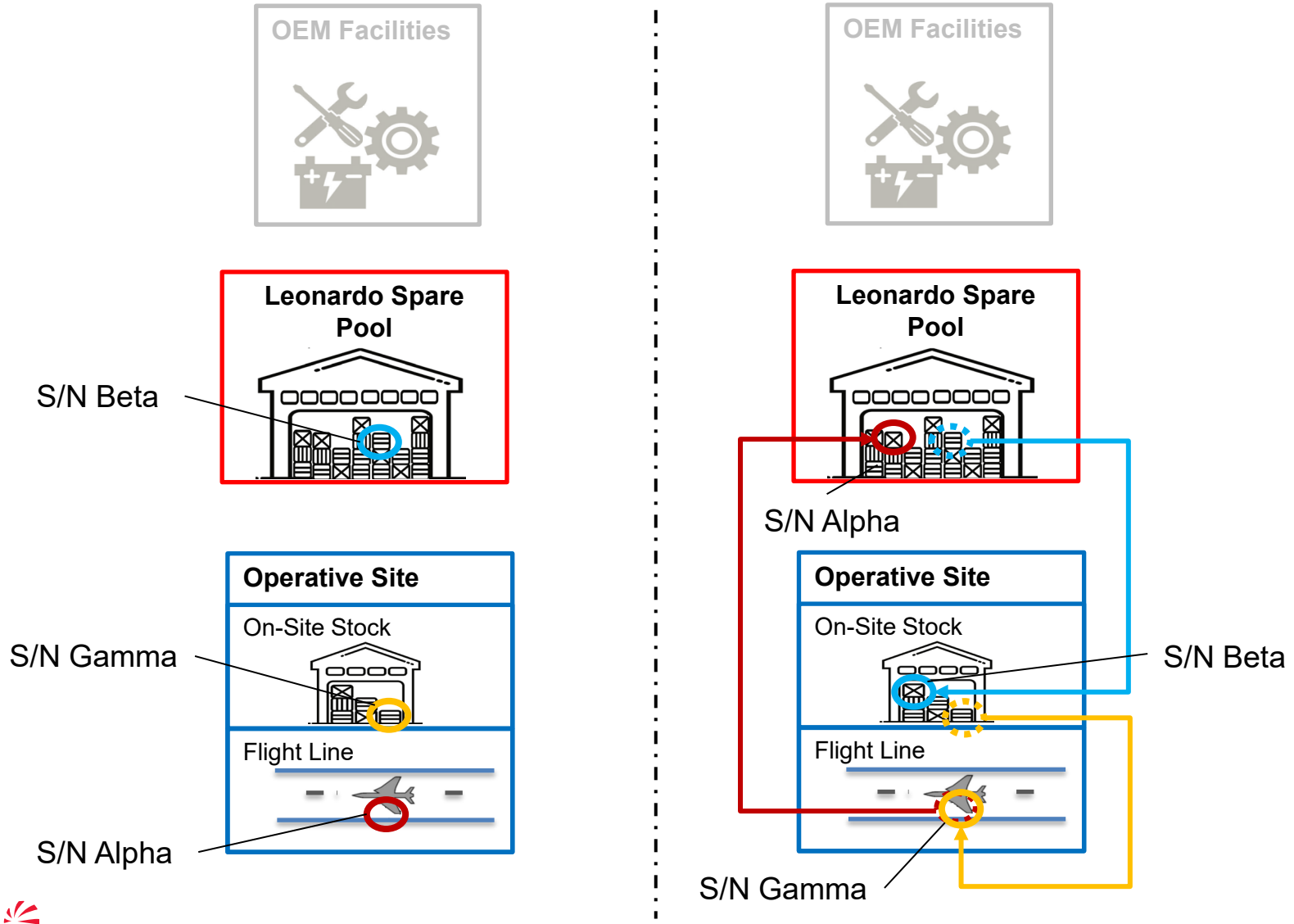

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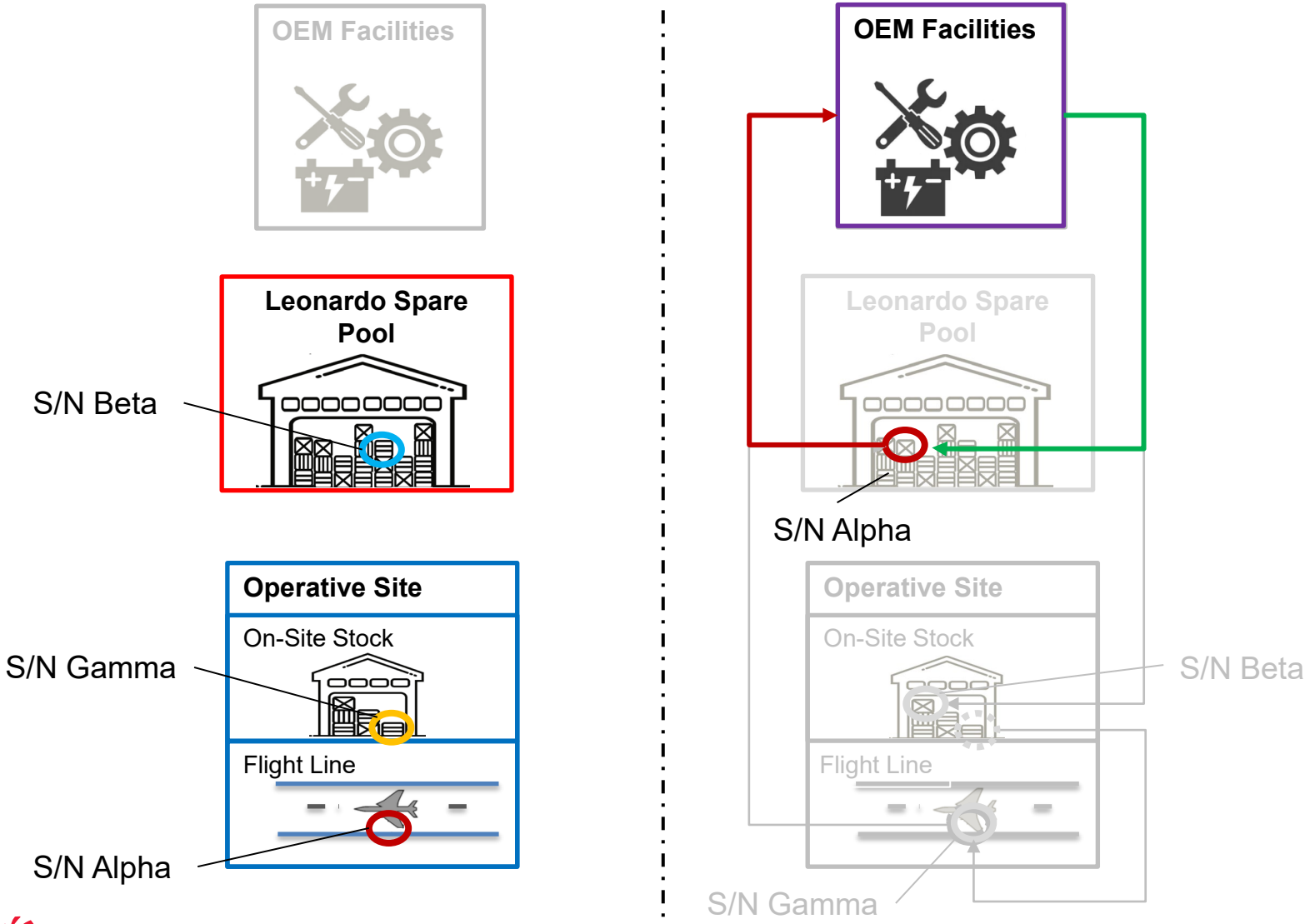

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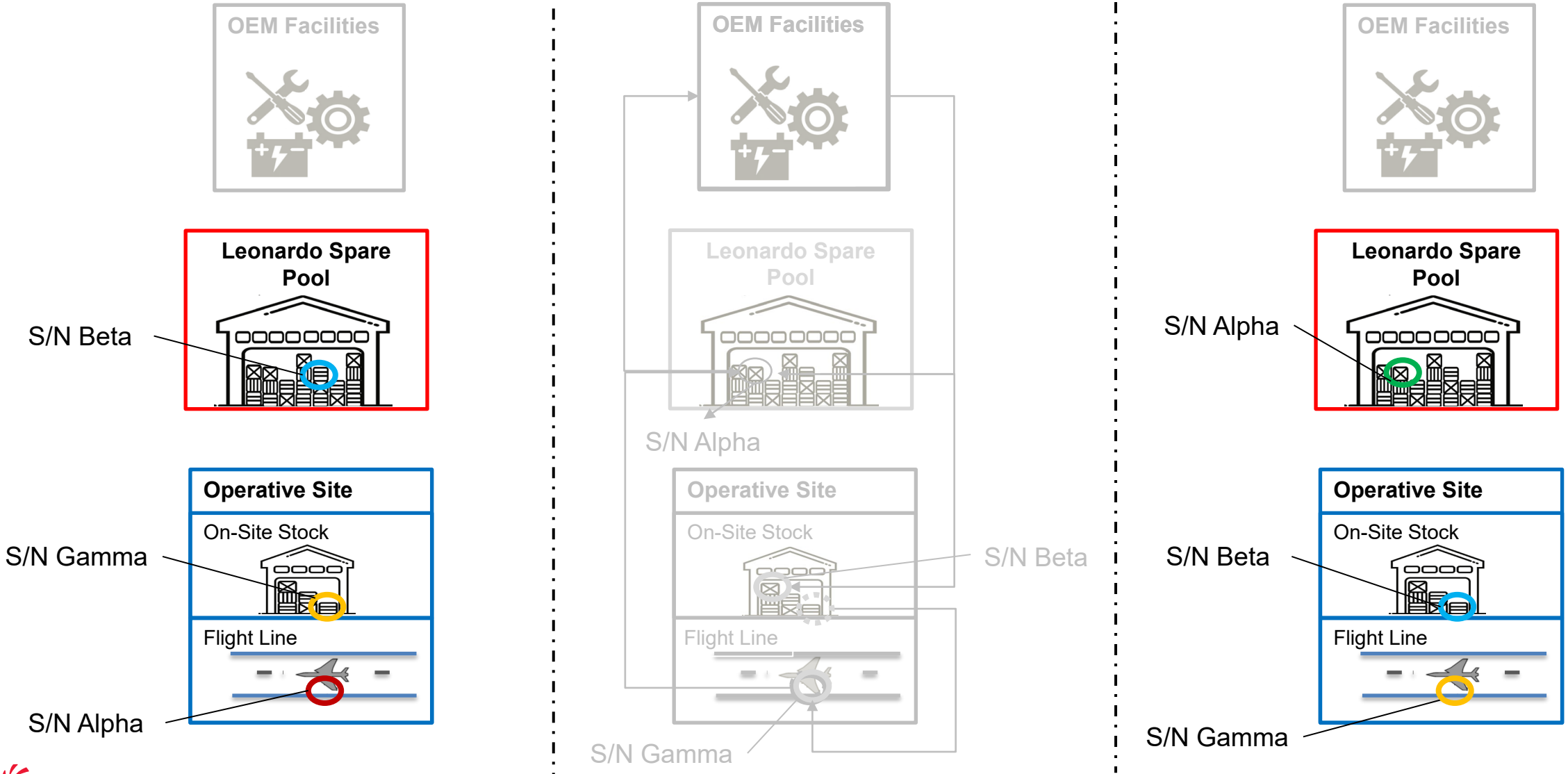
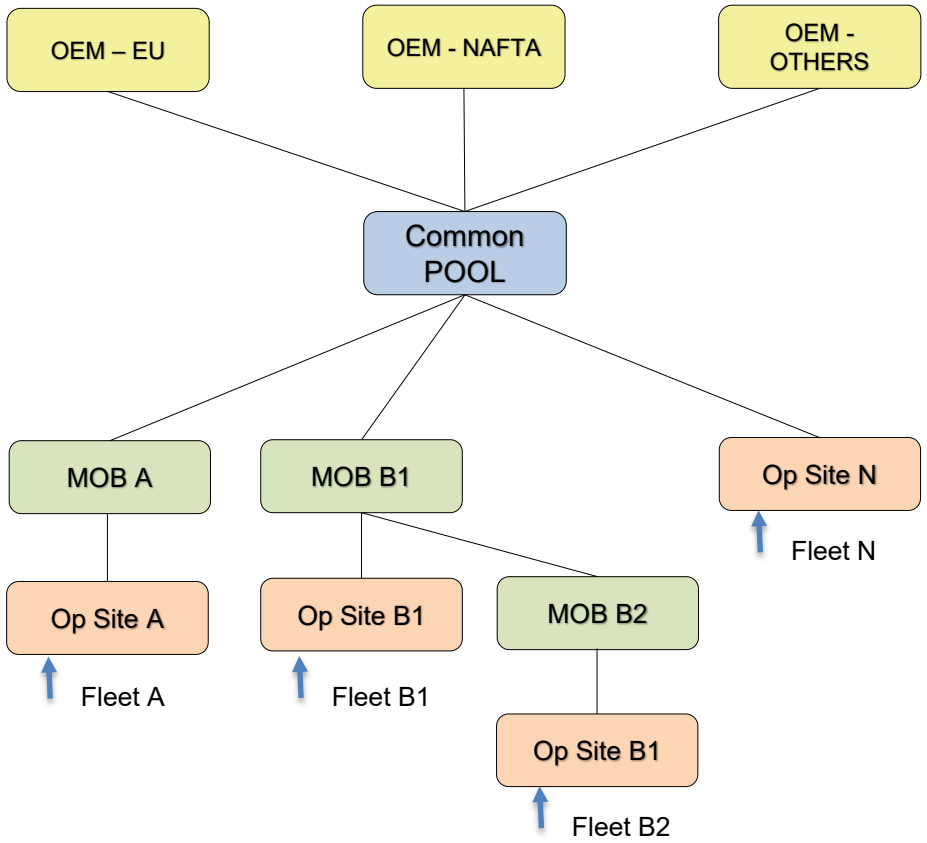


Spare parts Pooling – Affecting conditions

CUSTOMERS COMMON CONDITION:

- S/N exchange service for any Maintenance event (CM, PM) involving items replacement



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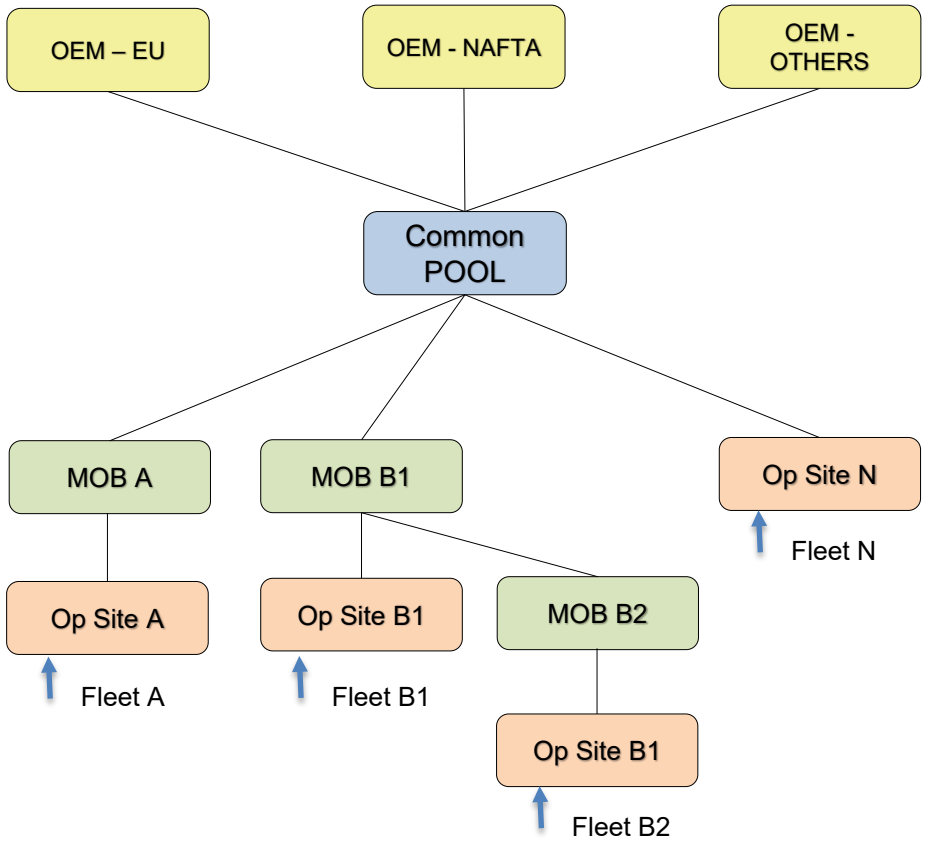
CUSTOMERS PECULIAR CONDITIONS

- Different input conditions:
  - **Operation** (number of ACs, RoE, prelife)
  - **Configuration** (QPA, mission kits)
  - **Environment & Utilization factors** (Reliability and PM Intervals)
  - **Maintenance Level & Capability**
  - **Logistic** (Transport Times, On-Site Stock Capability)
  - **Economic** (Definition of “Low” and “High” Item value)

- Different required **KPIs** (Fleet Availability, item WT)



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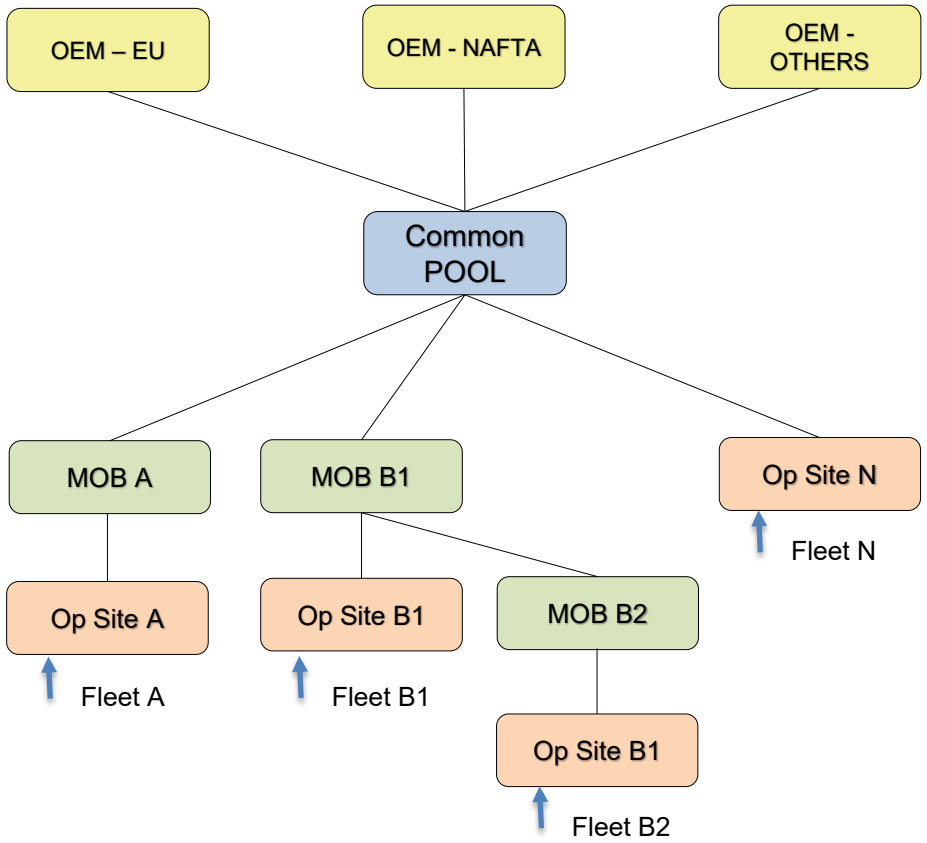

Time-variable conditions:

- Different RoE/number of ACs,
- Configurations updating,
- Extension of Pool access to new/other Clients
- Change of required KPIs
- Fleet aging…

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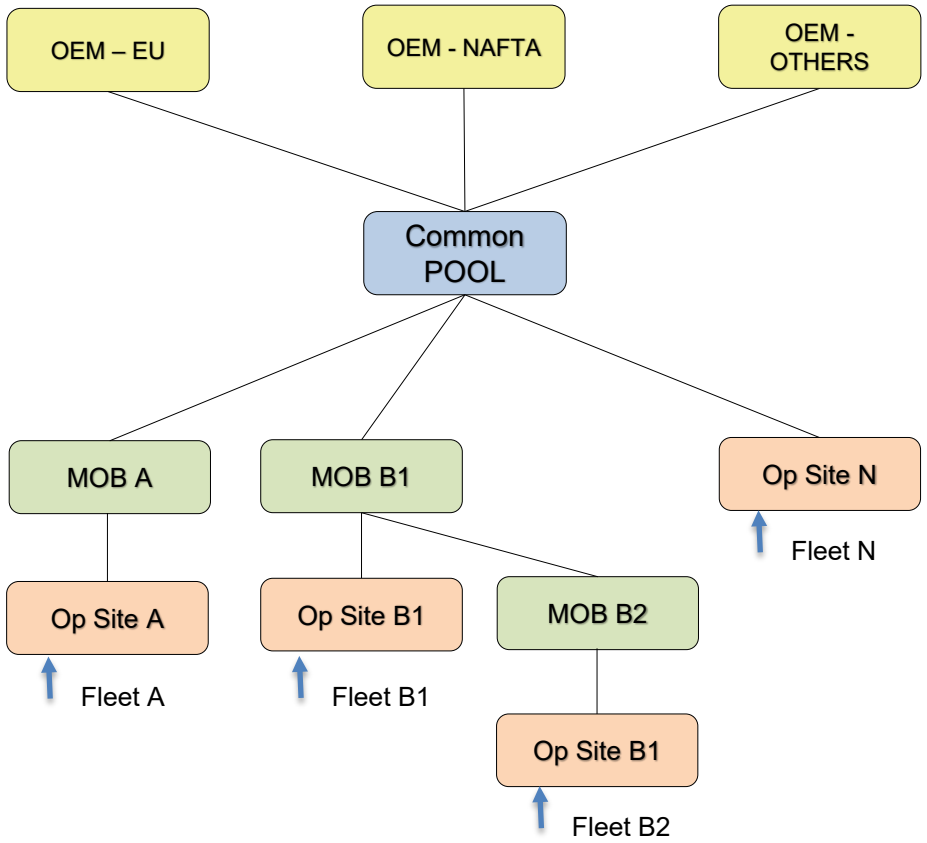

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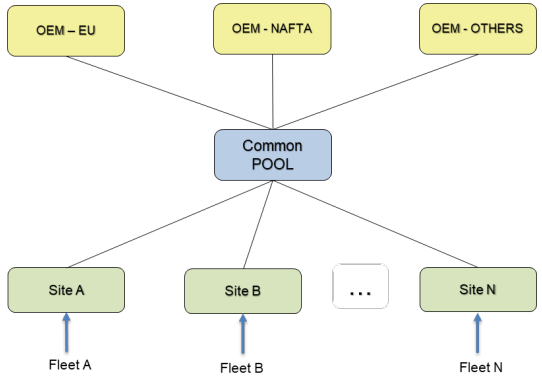
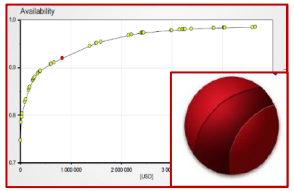
PBL Approach: consistency of support performance

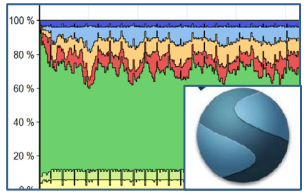
Spares support analysis: PBL-based approach

Previous time period





On-Site Stocks & Pool Stock dimensioning with steady-state conditions

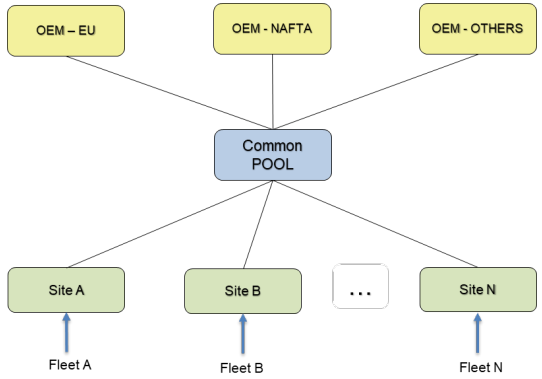


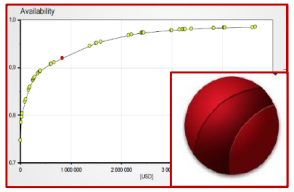
Performance analysis & Solution Improvement

Time period to analyze

Spares support analysis: PBL-based approach

Previous time period





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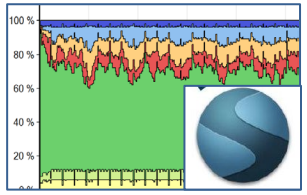

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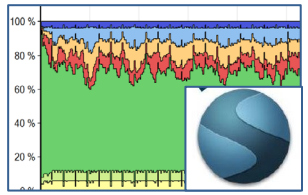
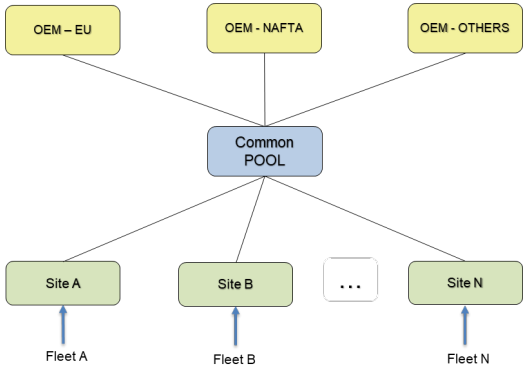
No condition changes occured

Variation of peaks of demand due to fleets aging



Analysis of new peaks of demand



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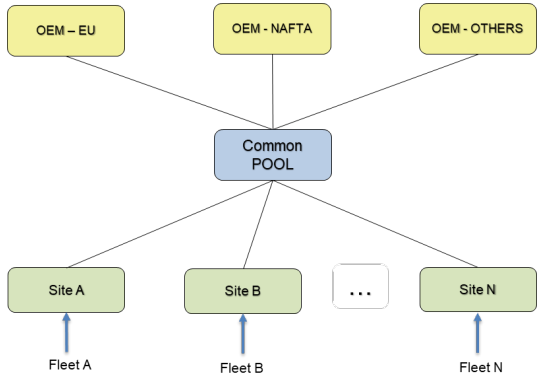

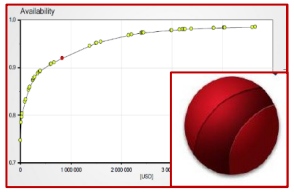

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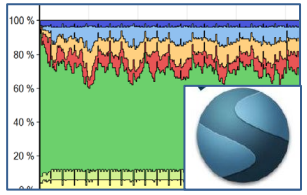

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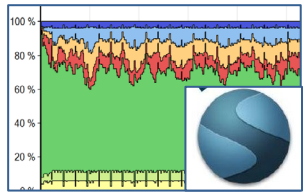

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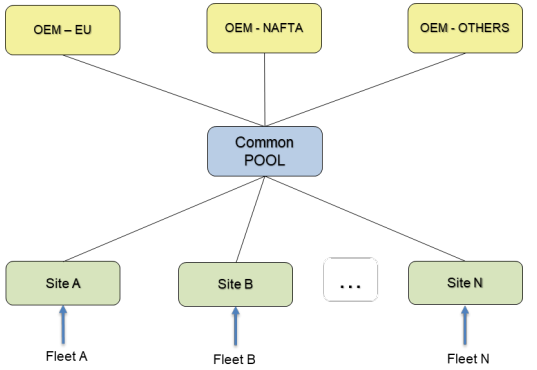
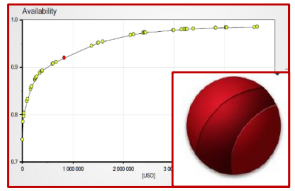
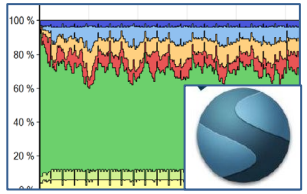


Condition changes occurred
(e.g: Pool access extended to a n+1 Client)

- Variation of peaks of demand due to fleets aging
- Additional demand of items applicable to the n+1 Client



Dimensioning of n+1 On-Site Stock & Pool Stock



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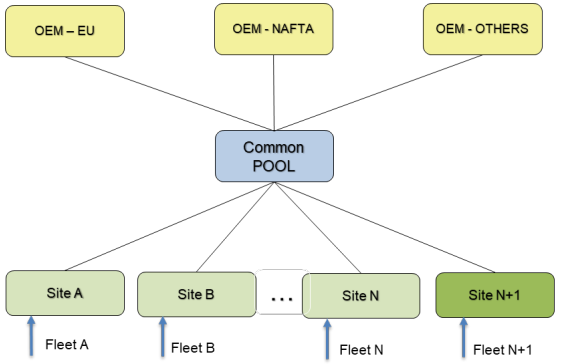
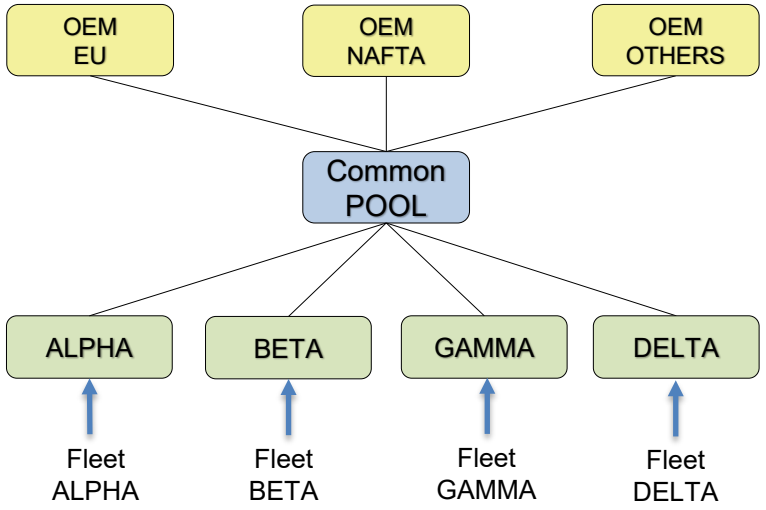


Case study - Overview

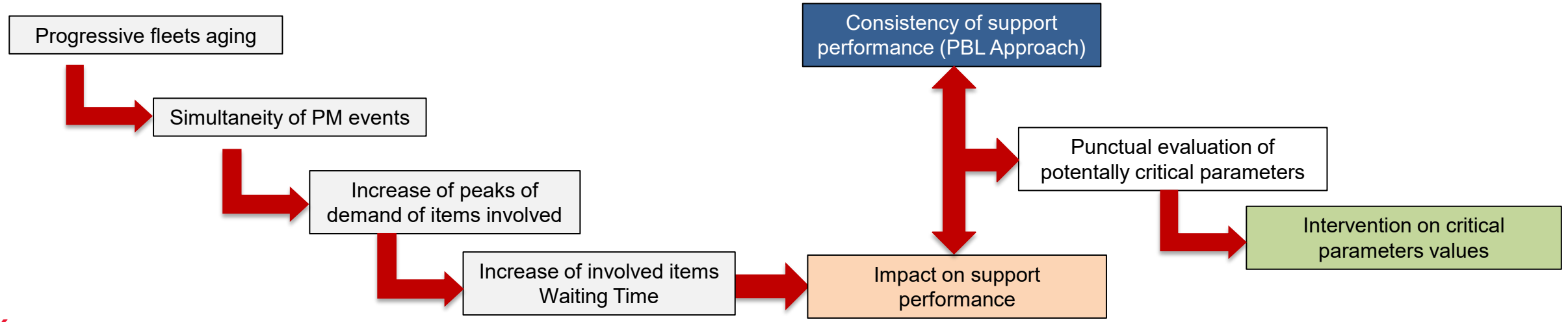
Peculiar conditions for each Customer

- **Scenario inputs:**
  - Fleet size
  - RoE
  - Transport Time to and from Spare Pool:
- **Contractual Requirements:**
  - Max SN exchange Time
  - Max AoG Time



- **Time support period:**
  Five years (T0 + 5 Y)
- **Additional statements**
  (in relation with preceding support scenario):
  - Each On-Site Stock & Pool Stock level is optimized (until T0)
  - No change of boundaries occurs in T0 + 5Y

Support period analysis



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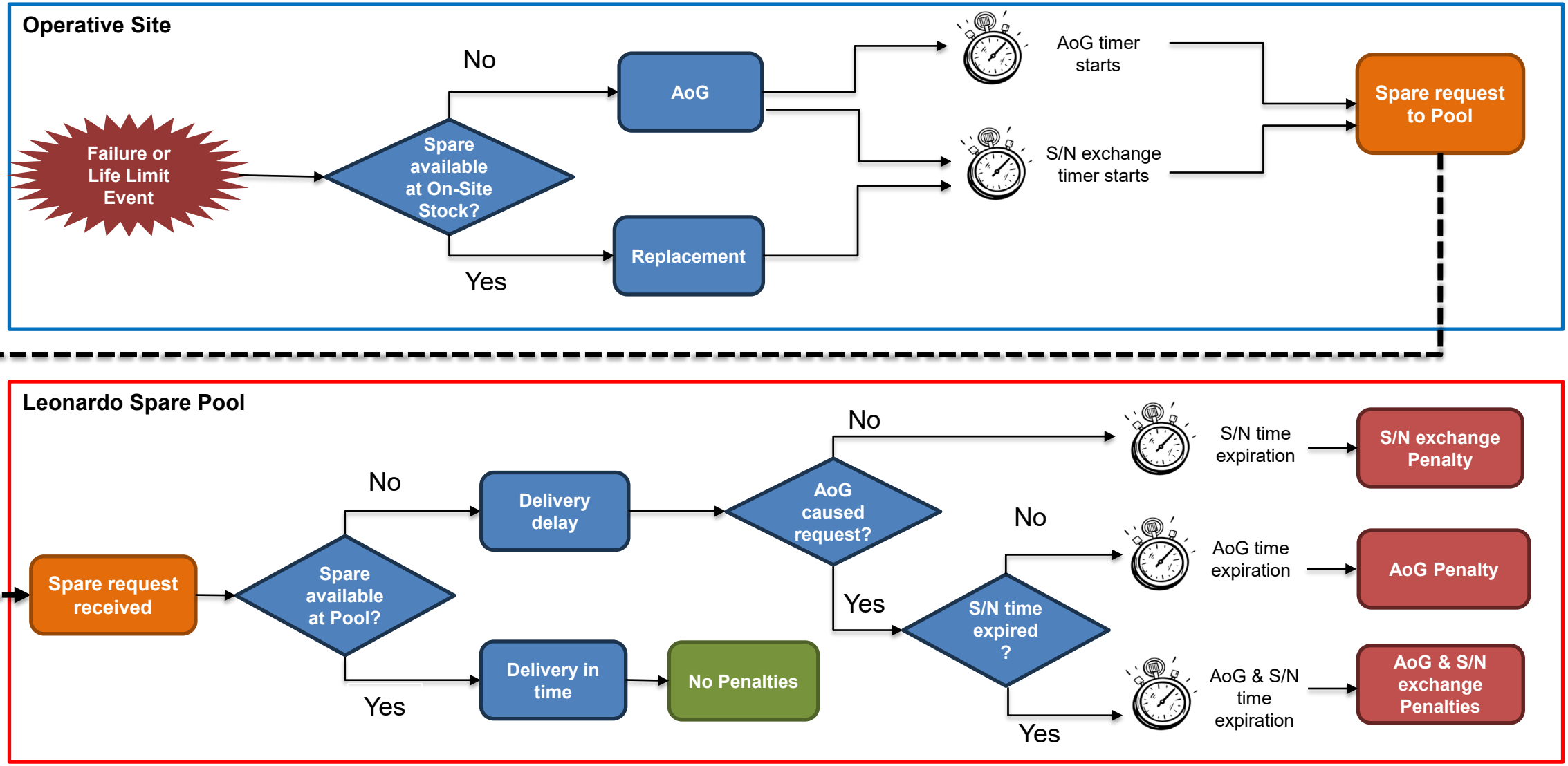

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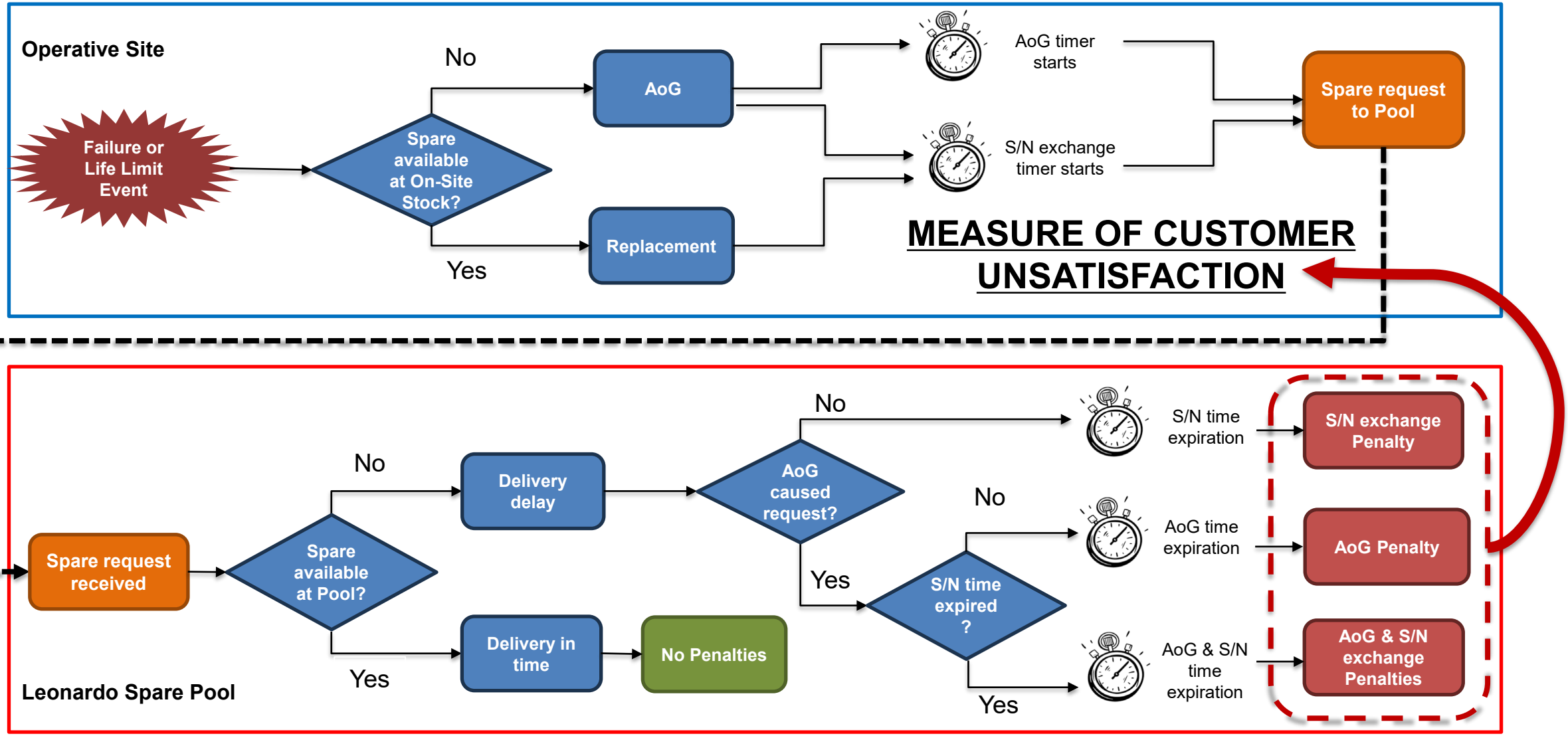

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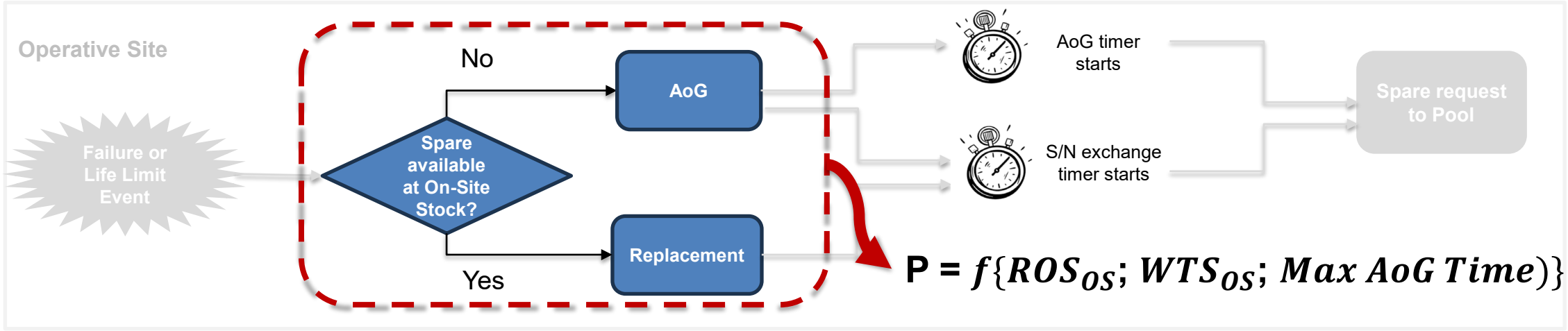
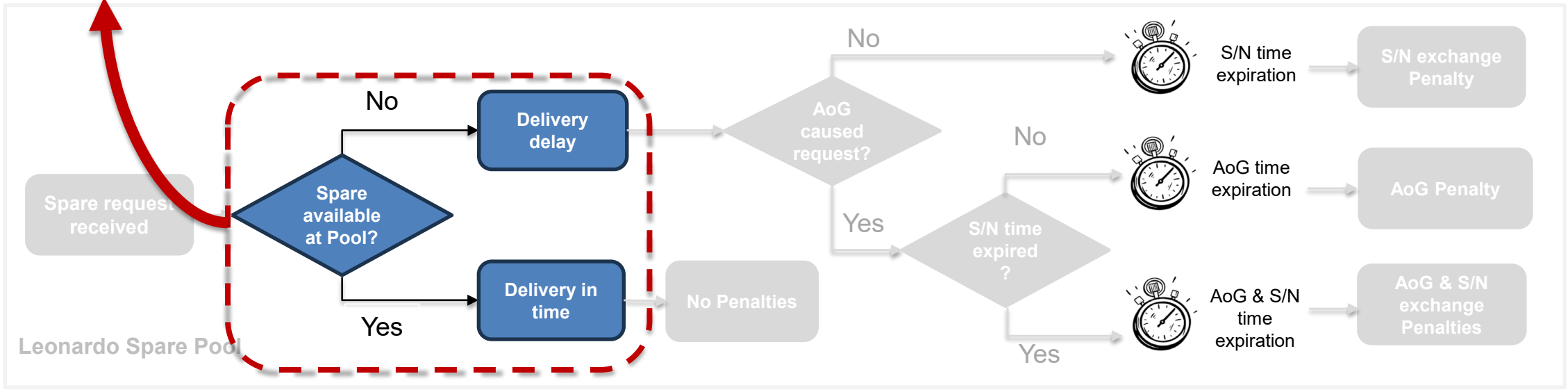


P = $f\{ROS_{Pool}\ ;\ WTS_{Pool}\ ;\ Max\ AoG\ Time\ ;\ Max\ SN\ exchange\ Time)\}$



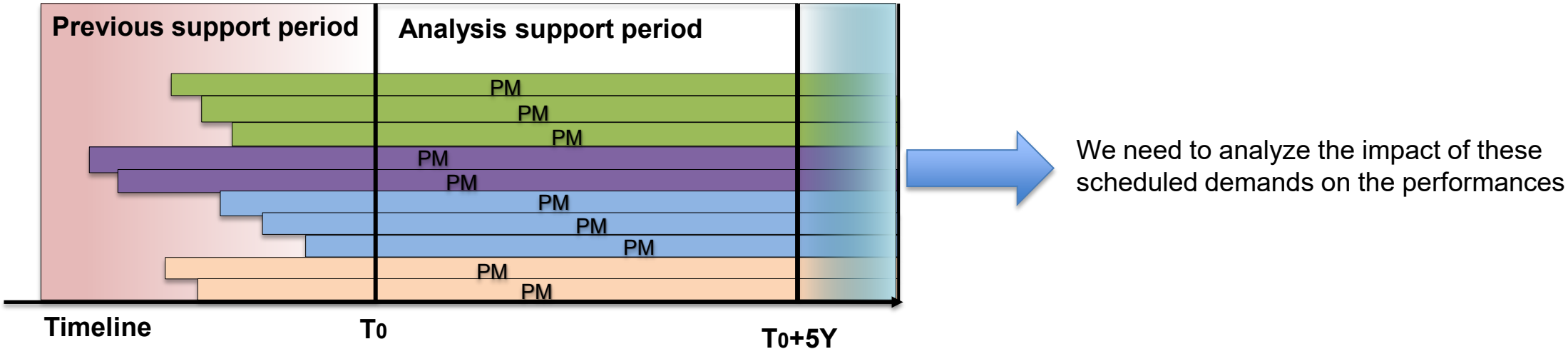
Case study - Analysis

Example Overview

Let's focus on the item i which needs an Overhaul every x years.

HP:

- At T_0 no Aircraft has reached the deadline yet.
- We expect that all the aircraft will face this scheduled event within the next 2-3 years.
- The stock sizing performed for the previous support period intentionally exclued these demand from the calcolus.



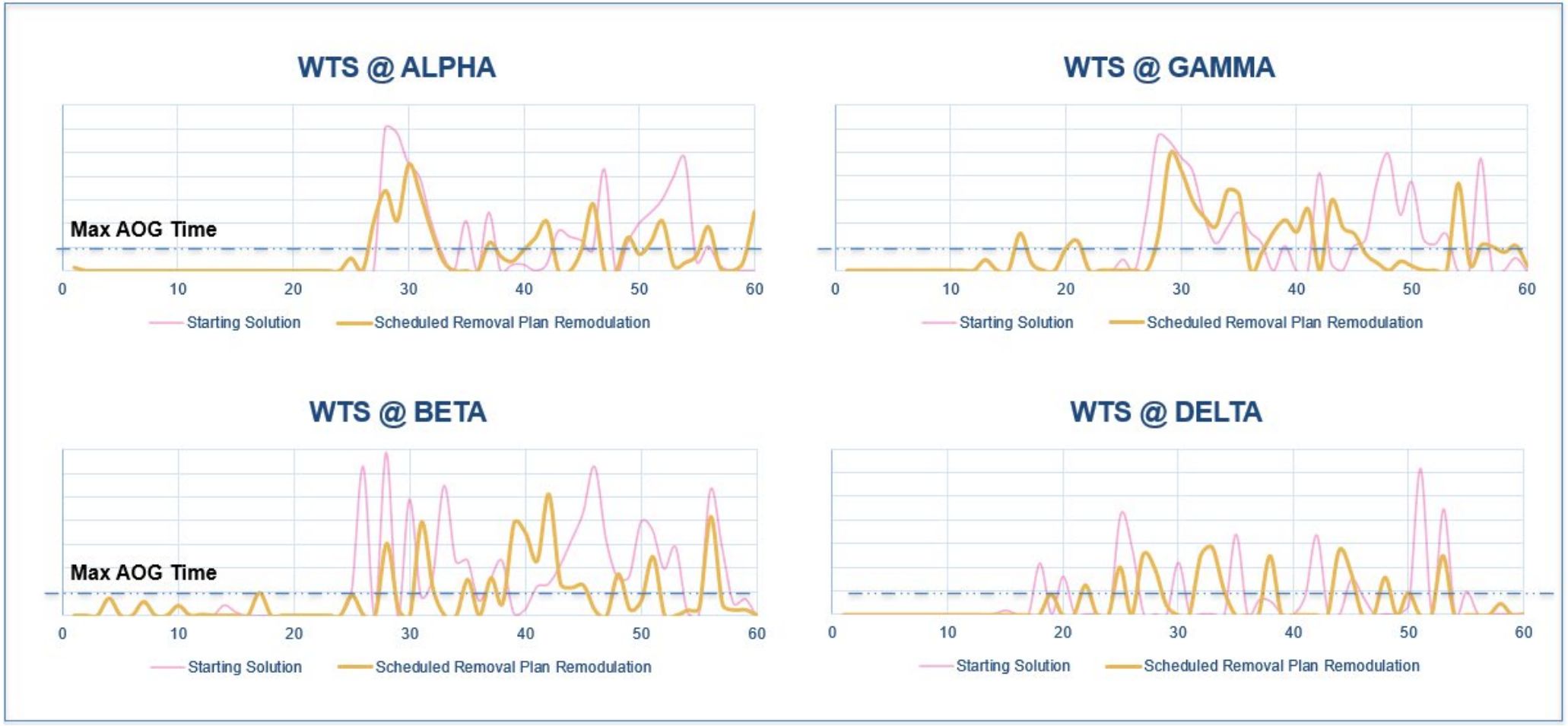
We need to analyze the impact of these scheduled demands on the performances

Case study - Analysis

Performance Analysis & Improvement

Case study - Analysis

Performance Analysis & Improvement



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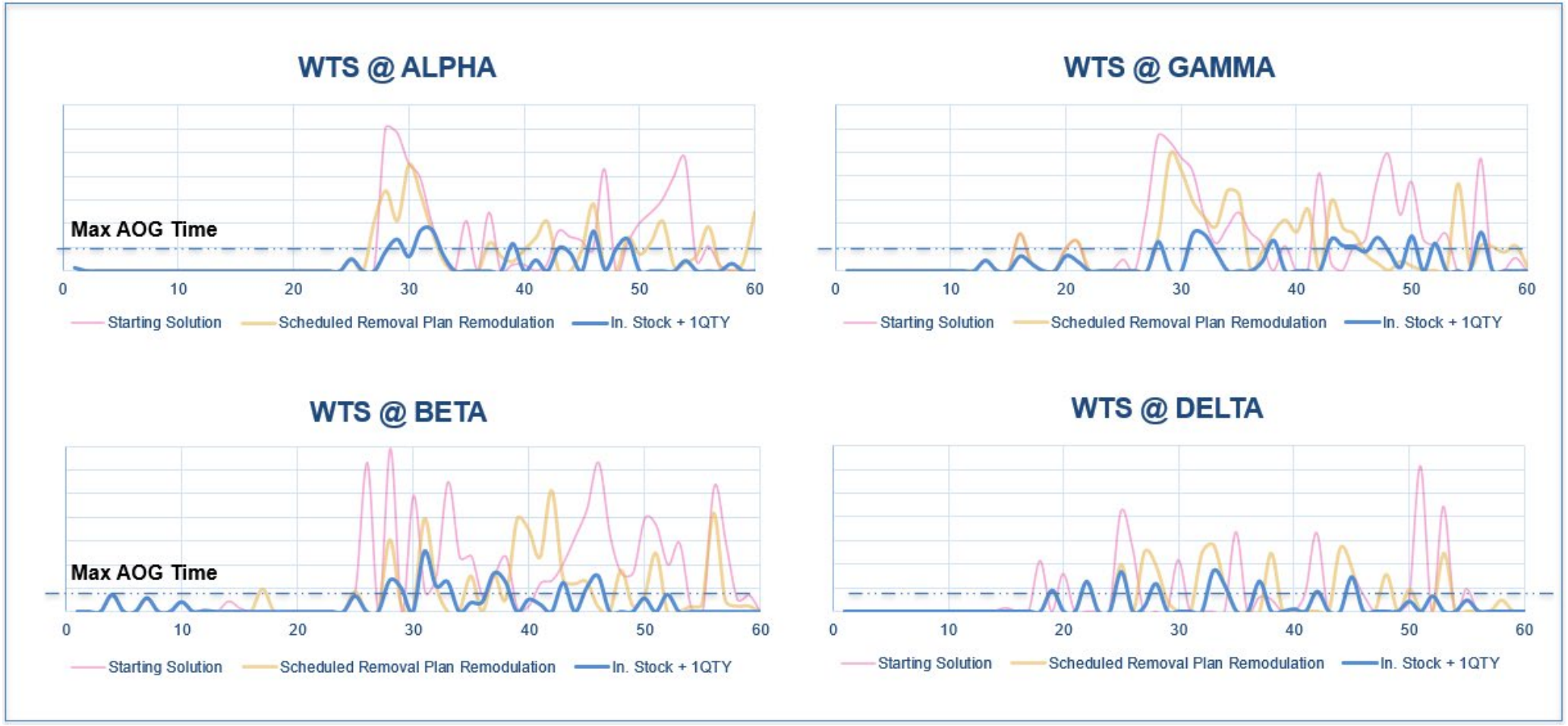
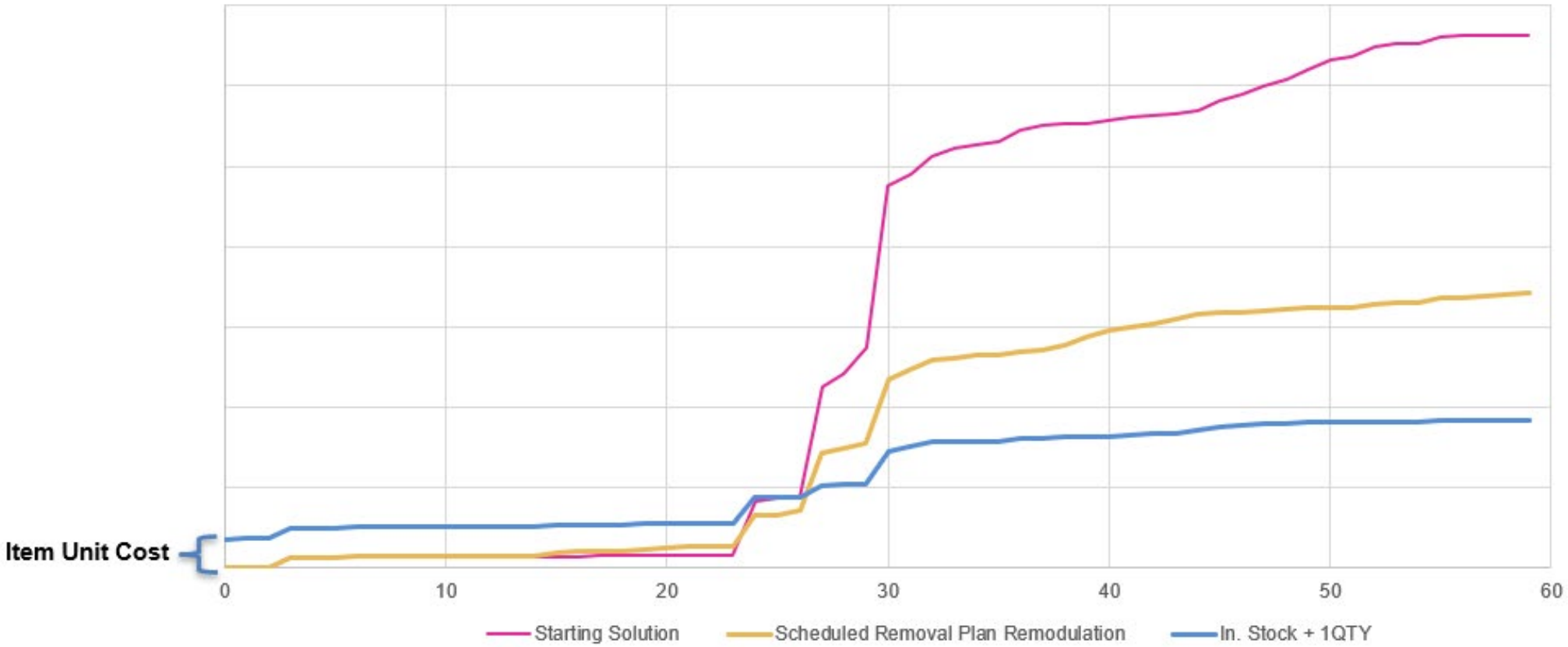


Case study - Analysis

Expected Penalty + Stock Related Costs through support period



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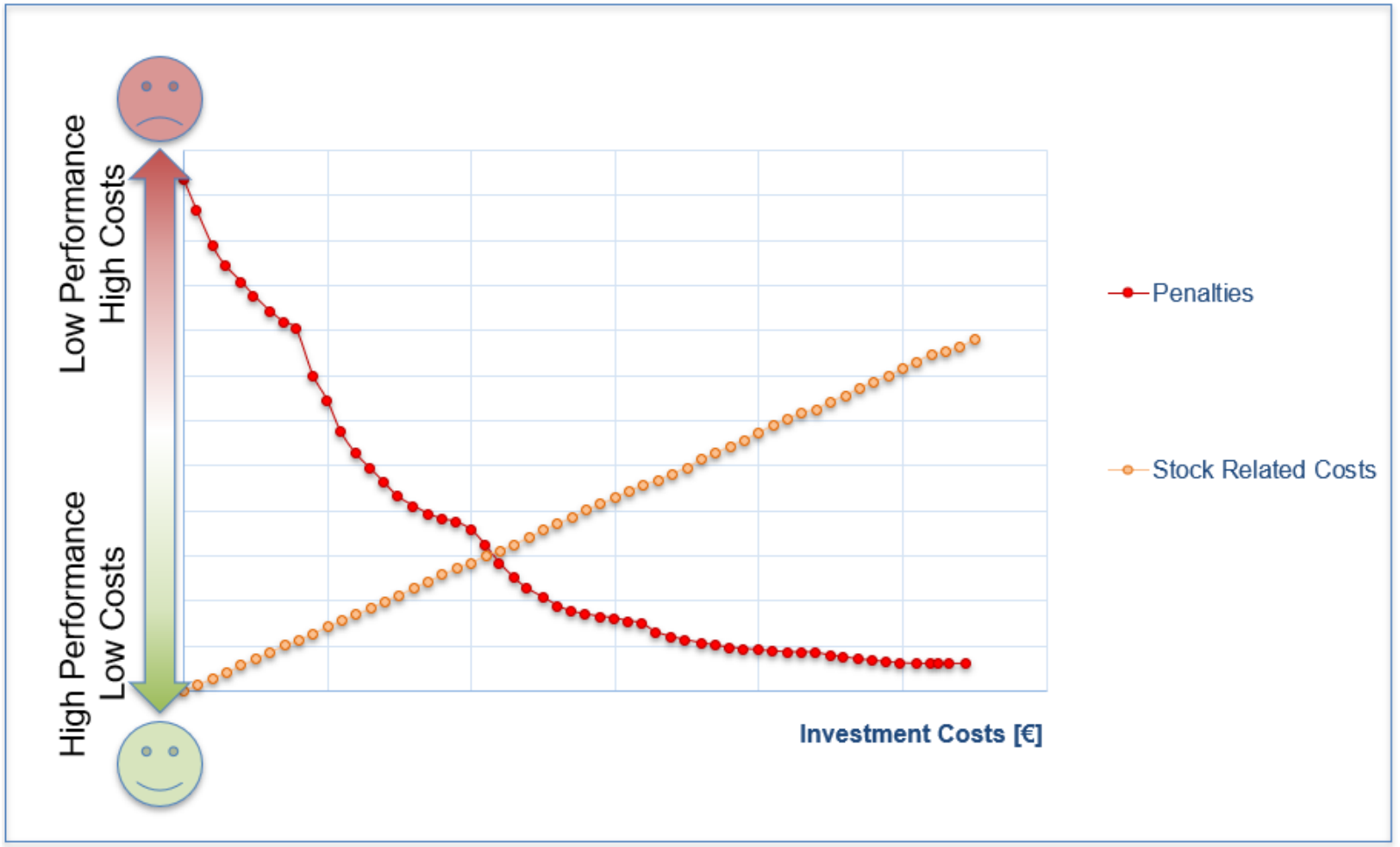
Cost / Effectiveness Optimization



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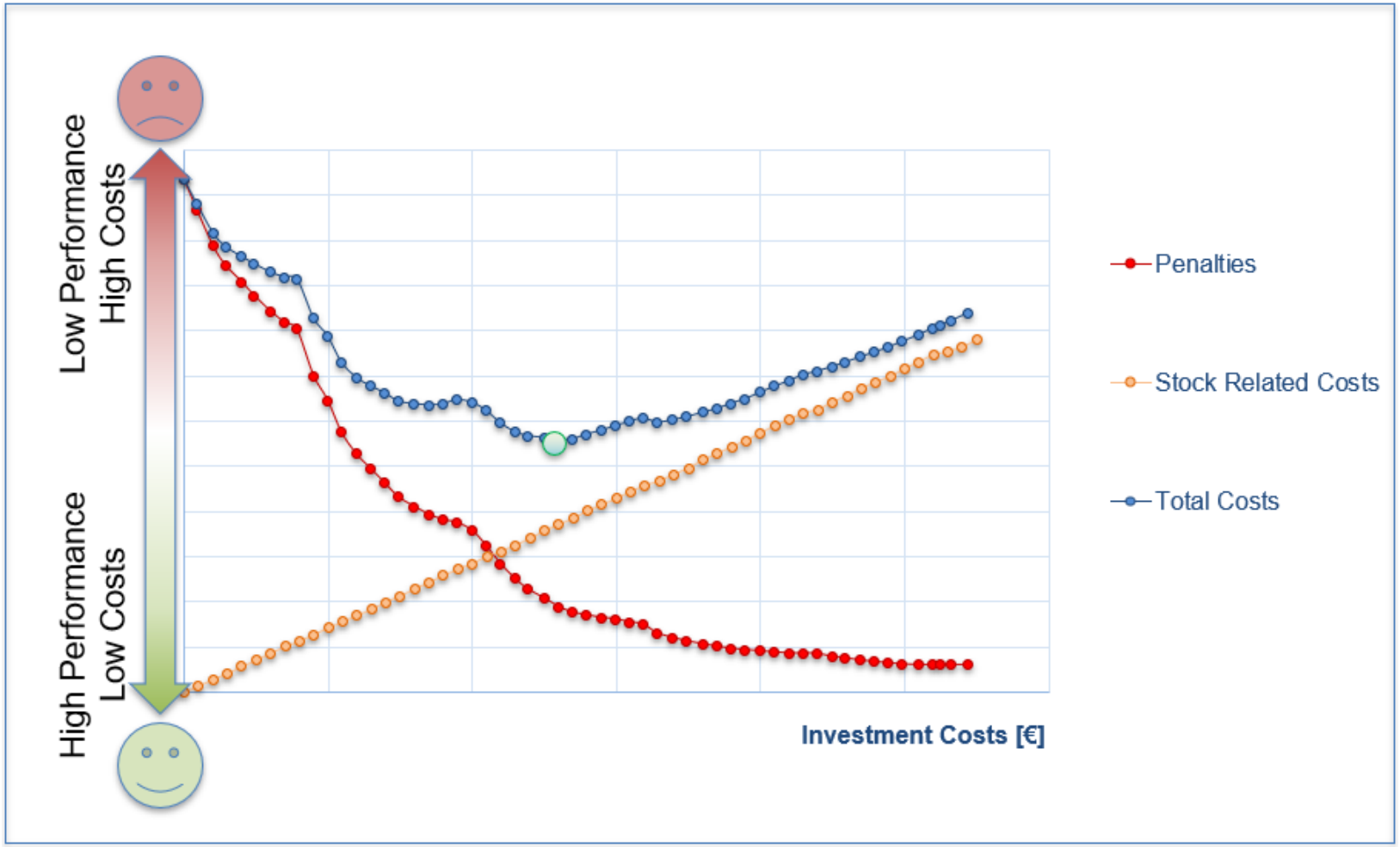

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THANK **YOU**
FOR YOUR ATTENTION

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