How OSIsoft PI supports Uniper's Maintenance Strategy Planning

How OSIsoft PI supports Uniper's Maintenance Strategy Planning

Dr.-Ing. Stephan van Aaken

Agenda – what can you expect?

Uniper at a glance

Who is Uniper? – a short introduction

Our approach

Our approach to digital transformation

Case study MSP

Case study – driving decisions, improve flexibility and efficiencies with the Maintenance Strategy Planning tool

Learnings

Our learnings gained during this journey

uni per

Uniper at a glance

Our operations

Power Generation

Commodity Trading

Energy Storage

Energy Sales

Industrial Services

40+ countries around the world
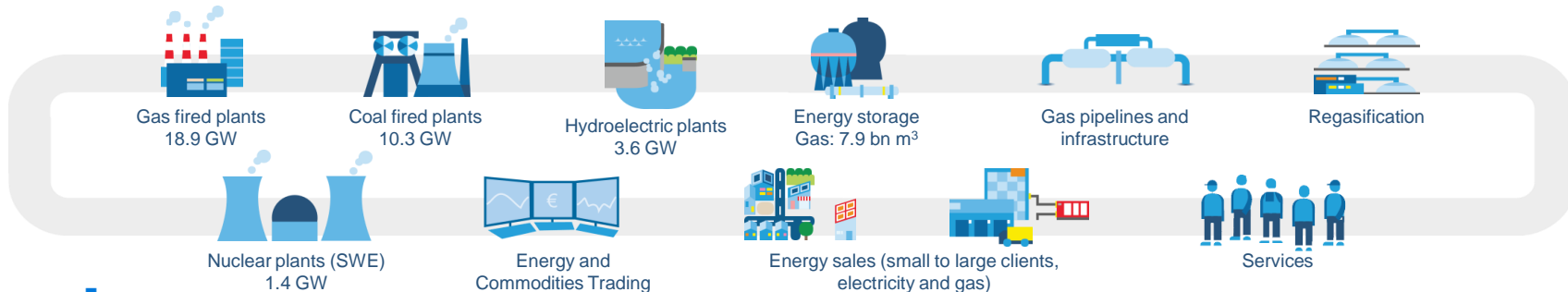Among largest generators in Europe

Employees: 11,780

○ Power generation, Storage, Services - Europe
○ Power generation - International
● Commodity Trading, Energy Sales

€1.5bn
EBITDA

100 years
Experience

37 GW
Generation

Main activities

Gas fired plants
18.9 GW

Coal fired plants
10.3 GW

Hydroelectric plants
3.6 GW

Energy storage
Gas: 7.9 bn m^3

Gas pipelines and
infrastructure

Regasification

Nuclear plants (SWE)
1.4 GW

Energy and
Commodities Trading

Energy sales (small to large clients,
electricity and gas)

Services

All values as of FYE 2018 (Financial Results 2018, List of Assets 2018)

Agenda – what can you expect?

Uniper at a glance

Who is Uniper? – a short introduction

Our approach

Our approach to digital transformation

Case study MSP

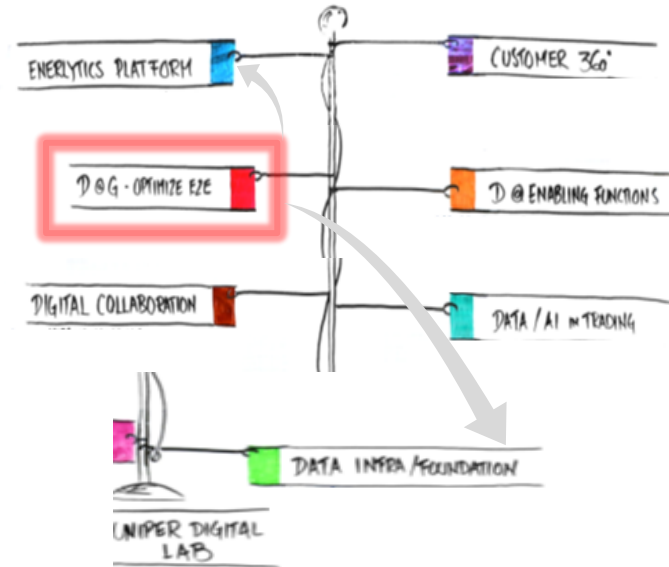Case study – driving decisions, improve flexibility and efficiencies with the Maintenance Strategy Planning
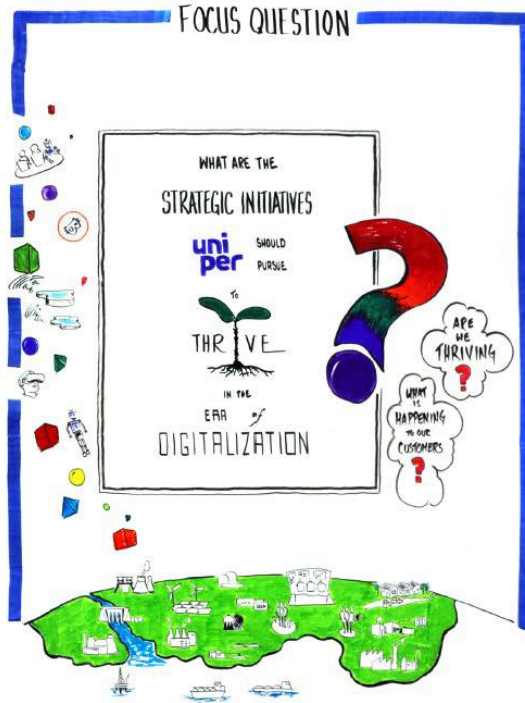
Learnings

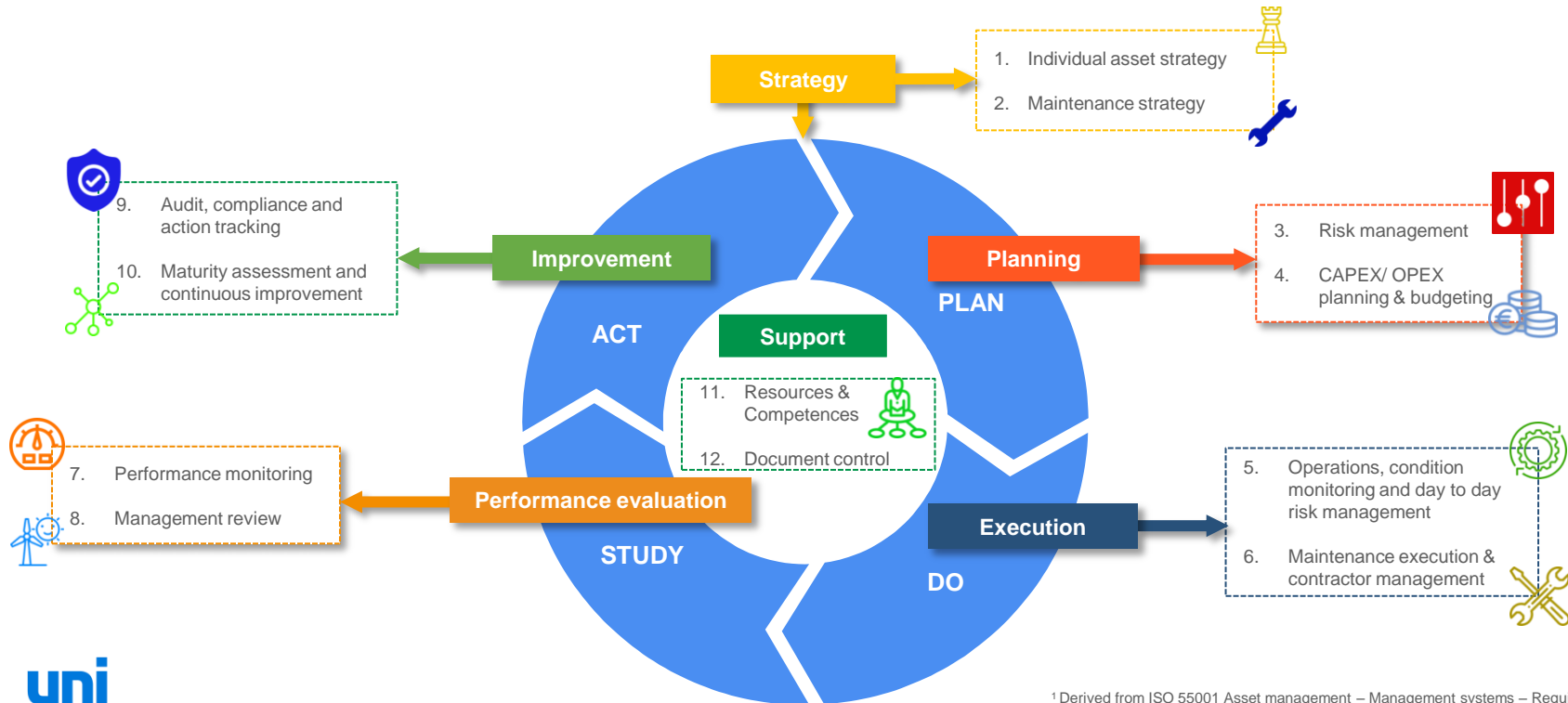Our learnings gained during this journey

Digital Transformation at Uniper
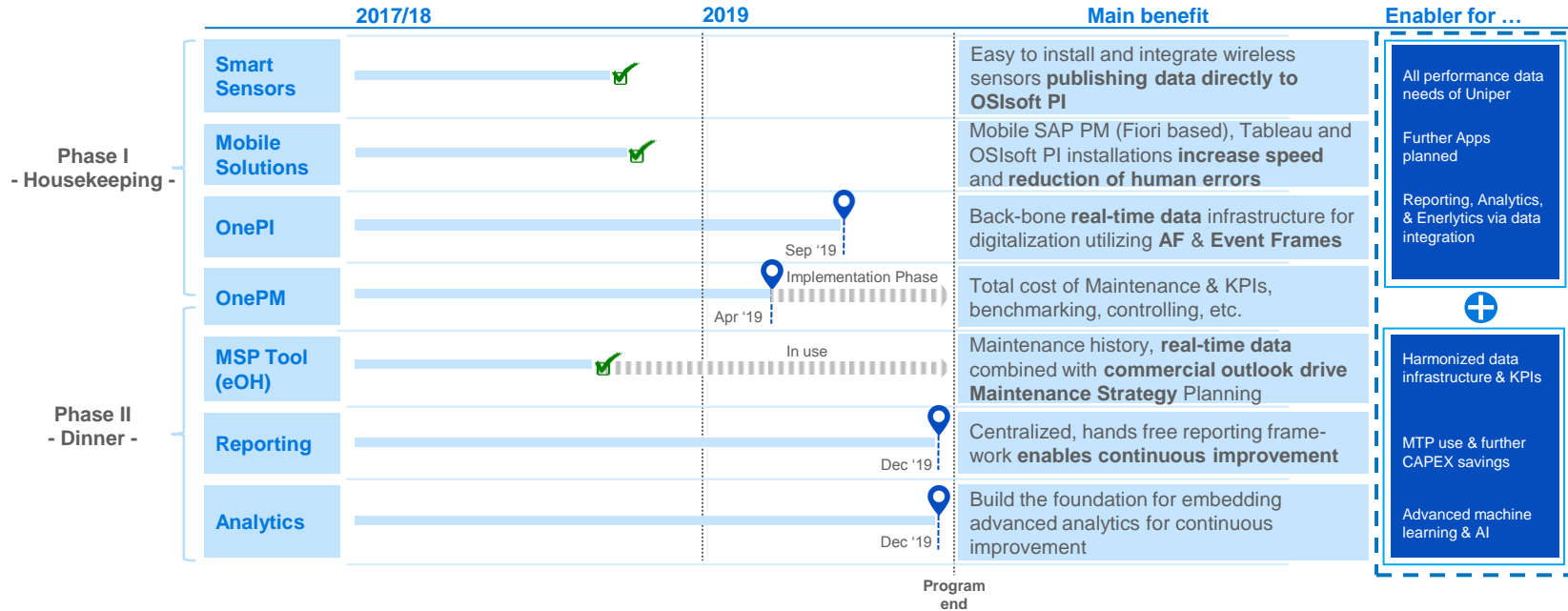
With agreed 9 strategic programs in 2017

D@G Optimize F2E is a business driven digitalization program

Digitalization @ Generation (D@G)
Front-to-end digitalization of our Asset Management processes at Uniper[1]

Strategy
1. Individual asset strategy
2. Maintenance strategy

Planning / PLAN
3. Risk management
4. CAPEX/ OPEX planning & budgeting

Execution / DO
5. Operations, condition monitoring and day to day risk management
6. Maintenance execution & contractor management

Performance evaluation / STUDY
7. Performance monitoring
8. Management review

Improvement / ACT
9. Audit, compliance and action tracking
10. Maturity assessment and continuous improvement

Support
11. Resources & Competences
12. Document control

[1] Derived from ISO 55001 Asset management – Management systems – Requirements

Digitalization @Generation
Housekeeping comes before dining

	2017/18	2019	Main benefit	Enabler for …

Phase I - Housekeeping -

Smart Sensors ✔ — Easy to install and integrate wireless sensors **publishing data directly to OSIsoft PI**

Mobile Solutions ✔ — Mobile SAP PM (Fiori based), Tableau and OSIsoft PI installations **increase speed** and **reduction of human errors**

OnePI — Sep '19 — Back-bone **real-time data** infrastructure for digitalization utilizing **AF** & **Event Frames**

OnePM — Apr '19 — Implementation Phase — Total cost of Maintenance & KPIs, benchmarking, controlling, etc.

Phase II - Dinner -

MSP Tool (eOH) ✔ — In use — Maintenance history, **real-time data** combined with **commercial outlook drive Maintenance Strategy** Planning

Reporting — Dec '19 — Centralized, hands free reporting frame-work **enables continuous improvement**

Analytics — Dec '19 — Build the foundation for embedding advanced analytics for continuous improvement

Program end

Enabler for …:
- All performance data needs of Uniper
- Further Apps planned
- Reporting, Analytics, & Enerlytics via data integration

➕

- Harmonized data infrastructure & KPIs
- MTP use & further CAPEX savings
- Advanced machine learning & AI

Abstract representation of the Uniper Architecture

User Systems

Reporting Governance	Analytic Governance	Reporting Governance
Security Model — Self-BI Solution for multiple sources – Tableau – — Security Model	Security Model — Data Lake – Databricks – — Security Model	Security Model — **Self-BI Solution real-time data – PI Vision –** — Security Model
Typical user groups • Central asset management / operations • Plant engineers • Trading functions	Typical user groups • Asset data scientists • Trading data scientists • Uniper Engineering Group	Typical user groups • Plant engineers • Central asset management / operations
Data Governance	Data Governance	Data Governance

Talend

Backend systems

Data warehouse: Bespoke Development – MS SQL Server & Snowflake –

IIOT Platform: **OSIsoft PI System***

Harmonized Economic Generation	Harmonized Production Volumes	Harmonized other data	Harmonized CCGT	Harmonized Steam	Harmonized Hydro

Talend

Economic Generation	Production Vol.	other data e.g. prices, unavailability, technical, etc.	CCGT Grain	Steam Ratcliffe	Hydro SWE/D
F & DE UK SWE	F & DE UK SWE		CCGT	Steam	Hydro

uni per

*The data historian is only used for technical sensor data.

Agenda – what can you expect?

Uniper at a glance

Who is Uniper? – a short introduction

Our approach

Our approach to digital transformation

Case study MSP

Case study – driving decisions, improve flexibility and efficiencies with the Maintenance Strategy Planning

Learnings

Our learnings gained during this journey

Digitalization @ Generation (D@G)
Front-to-end digitalization of our Asset Management processes at Uniper[1]

Strategy
1. Individual asset strategy
2. Maintenance strategy

Planning / **PLAN**
3. Risk management
4. **CAPEX/ OPEX planning & budgeting**

Execution / **DO**
5. Operations, condition monitoring and day to day risk management
6. Maintenance execution & contractor management

Performance evaluation / **STUDY**
7. Performance monitoring
8. Management review

Improvement / **ACT**
9. Audit, compliance and action tracking
10. Maturity assessment and continuous improvement

Support
11. Resources & Competences
12. Document control

[1] Derived from ISO 55001 Asset management – Management systems – Requirements

Maintenance Strategy Planning Digitalization

Ind. Asset strategy

Commercial Data

Risk appetite, Commercial driver
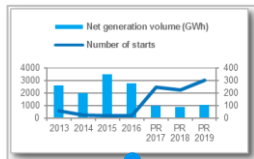
Forecast (operation regime)
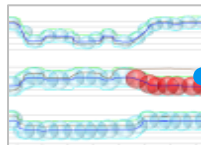
Adv. condition monitoring
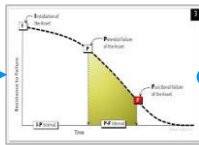
Predictive Mant.Tools

Online Monitoring

Live risks

MSP tool
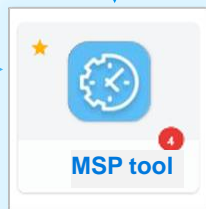
PI System

Smart sensors

Mobile solutions

Live data

Technical Data

MSP Main Table Area
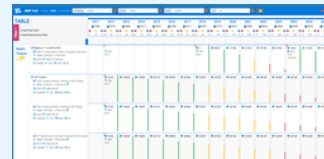
Commercial Outage Simulation

Fleet Outage Overview

Overview of Plant Item's life

Opex Profile (M€)

Capex Profile (M€)

Cash flow
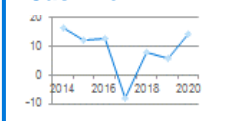
An in-depth look into some of the key functionalities

The table represents the areas where the maintenance managers can enter their data and visualize the maintenance across a selected time period, thus going into detail while keeping a high level view

OSIsoft PI is an essential component for the MSP Tool
Asset Framework is used to derive cold/warm/hot starts
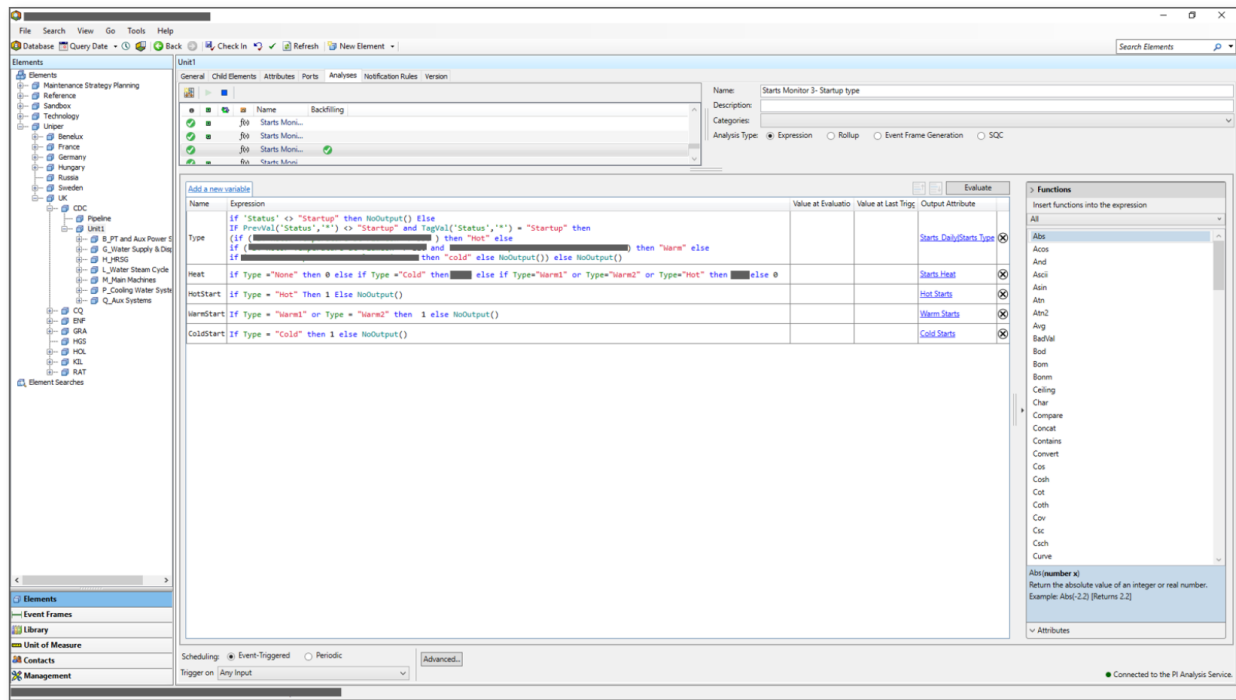
Elements

- Elements
  - Maintenance Strategy Planning
  - Reference
  - Sandbox
  - Technology
  - Uniper
    - Benelux
    - France
    - Germany
    - Hungary
    - Russia
    - Sweden
    - UK
      - CDC
        - Pipeline
        - Unit1
          - B_PT and Aux Power S
          - G_Water Supply & Disp
          - H_HRSG
          - L_Water Steam Cycle
          - M_Main Machines
          - P_Cooling Water Syste
          - Q_Aux Systems
      - CQ
      - ENF
      - GRA
      - HGS
      - HOL
      - KIL
      - RAT
  - Element Searches

Elements
Event Frames
Library
Unit of Measure
Contacts
Management

Unit1

General | Child Elements | Attributes | Ports | Analyses | Notification Rules | Version

			Name	Backfilling
✓		f(x)	Starts Moni...	
✓		f(x)	Starts Moni...	
✓		f(x)	Starts Moni...	✓
✓		f(x)	Starts Moni...	

Name: Starts Monitor 3- Startup type
Description:
Categories:
Analysis Type: ● Expression   ○ Rollup   ○ Event Frame Generation   ○ SQC

Add a new variable

Evaluate

Name	Expression	Value at Evaluatio	Value at Last Trigg	Output Attribute	
Type	if 'Status' <> "Startup" then NoOutput() Else IF PrevVal('Status','*') <> "Startup" and TagVal('Status','*') = "Startup" then (if ( ) then "Hot" else if (and) then "Warm" else if (then "cold" else NoOutput()) else NoOutput()			Starts_Daily|Starts Type	⊗
Heat	if Type ="None" then 0 else if Type ="Cold" then ▨ else if Type="Warm1" or Type="Warm2" or Type="Hot" then ▨ else 0			Starts Heat	⊗
HotStart	if Type = "Hot" Then 1 Else NoOutput()			Hot Starts	⊗
WarmStart	If Type = "Warm1" or Type = "Warm2" then 1 else NoOutput()			Warm Starts	⊗
ColdStart	If Type = "Cold" then 1 else NoOutput()			Cold Starts	⊗

Scheduling: ● Event-Triggered   ○ Periodic   Advanced...
Trigger on Any Input

> Functions

Insert functions into the expression

All

- Abs
- Acos
- And
- Asin
- Atn
- Atn2
- Avg
- BadVal
- Bod
- Bom
- Bonm
- Ceiling
- Char
- Compare
- Concat
- Contains
- Convert
- Cos
- Cosh
- Cot
- Coth
- Cov
- Csc
- Csch
- Curve

Abs(number x)
Return the absolute value of an integer or real number.
Example: Abs(-2.2) [Returns 2.2]

∨ Attributes

● Connected to the PI Analysis Service.

Maintenance Strategy Planning Digitalization

Benefits for Uniper

Transparency

- Historical, live & forecast data
- **Remaining life** on equipment level for the portfolio
- Annual **CAPEX & OPEX** profiles
- **Total cost** and duration of **maintenance**
- **Risk profiles** of components / units / fleets
- Transparency on sustainable CAPEX level
- Visibility of **fleetwide maintenance expenditures**

- **Optimize** availability, reliability, risk levels **based on commercial situation**
- Fully consume **lifetime**
- **Optimize** planned and decrease unplanned **maintenance**
- **Flexible Maintenance** as per future market condition
- Optimize and prioritize maintenance expenditure
- Capture **market opportunities** more reliable
- **Fleetwide optimization of procurement**/tender processes
- **Optimize outage** scoping and scheduling

New value pools

- Maintenance Services – Maintenance and repair strategies, OEM-independent and based upon actual plant condition and operational priority
- O&M services
- Enerlytics - Our platform for the Energy Industry

uni
per

Agenda – what can you expect?

Uniper at a glance

Who is Uniper? – a short introduction

Our approach

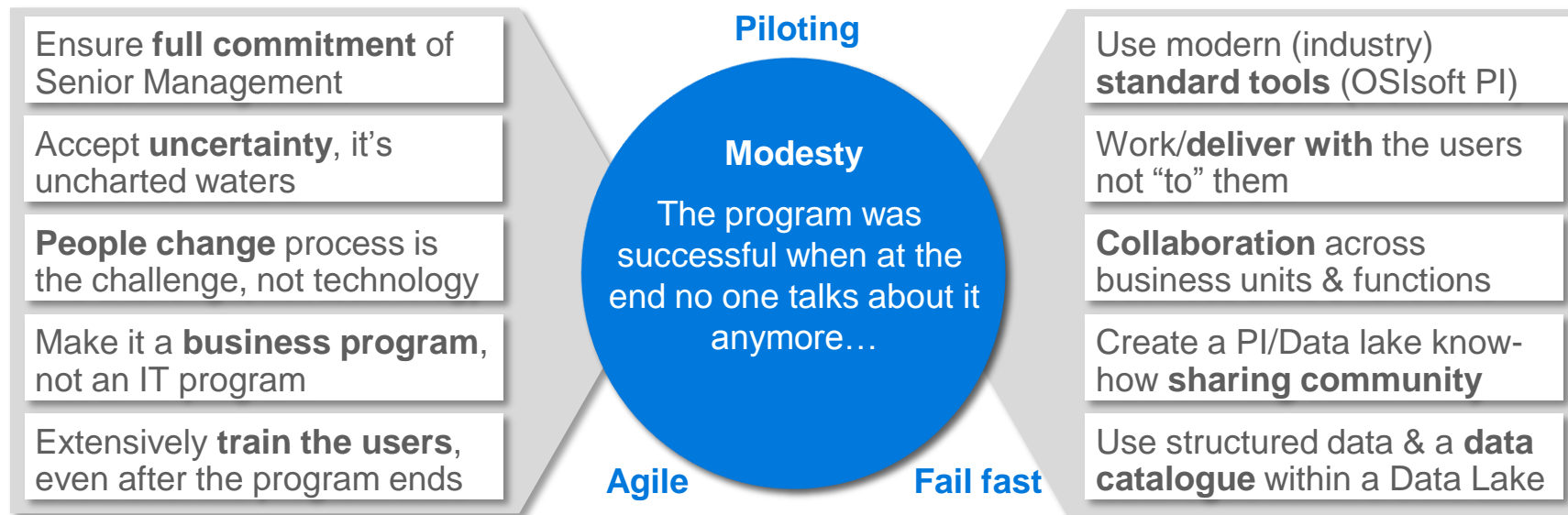Our approach to digital transformation

Case study MSP

Case study – driving decisions, improve flexibility and efficiencies with the Maintenance Strategy Planning

Learnings

Our learnings gained during this journey

What was essential for the success from a Uniper perspective?

Ensure **full commitment** of Senior Management

Accept **uncertainty**, it's uncharted waters

People change process is the challenge, not technology

Make it a **business program**, not an IT program

Extensively **train the users**, even after the program ends

Piloting

Modesty

The program was successful when at the end no one talks about it anymore…

Agile

Fail fast

Use modern (industry) **standard tools** (OSIsoft PI)

Work/**deliver with** the users not "to" them

Collaboration across business units & functions

Create a PI/Data lake know-how **sharing community**

Use structured data & a **data catalogue** within a Data Lake

Uniper SE

How OSIsoft PI supports Uniper's Maintenance Strategy Planning

CHALLENGE

Plant operations data is the foundation of our **maintenance planning**. The collection of accurate data and its validation was extremely difficult.

- High probability of errors when updating data manually
- Low frequency of data due to manual effort
- Expensive integrations with different systems

SOLUTION

One single connection from PI to our Atonyx Data Lake allowed us to get all the needed data in an accurate and almost live frequency.

- Accurate historical & current data
- Automatic updates & data flow
- Using Asset Framework we can derive exact OH, starts (cold/warm/hot) for all relevant components.

RESULTS

Next generation maintenance planning based on reliable and live data.

- Allowed the implementation and successful use of the MSP tool group-wide via our enerlytics[1] platform.

The tool reduced our CAPEX spend by 16%!

How OSIsoft PI support Uniper's Maintenance Strategy Planning

Dr.-Ing. Stephan van Aaken
Stephan.van.Aaken@uniper.energy
Vice President Asset IT
Architecture and Optimization
Uniper SE

Questions?

Please wait for the **microphone**

State your **name & company**

Please remember to…

Complete Survey!
Navigate to this session in mobile agenda for survey

TO DOWNLOAD APP, SEARCH OSISOFT PI WORLD

Download on the App Store

GET IT ON Google Play

OSIsoft. PI World

uni per