Condition based monitoring - enabling efficient maintenance

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Europe’s largest producer of renewable energy

OWN CAPACITY

19 300 MW

PRODUCTION

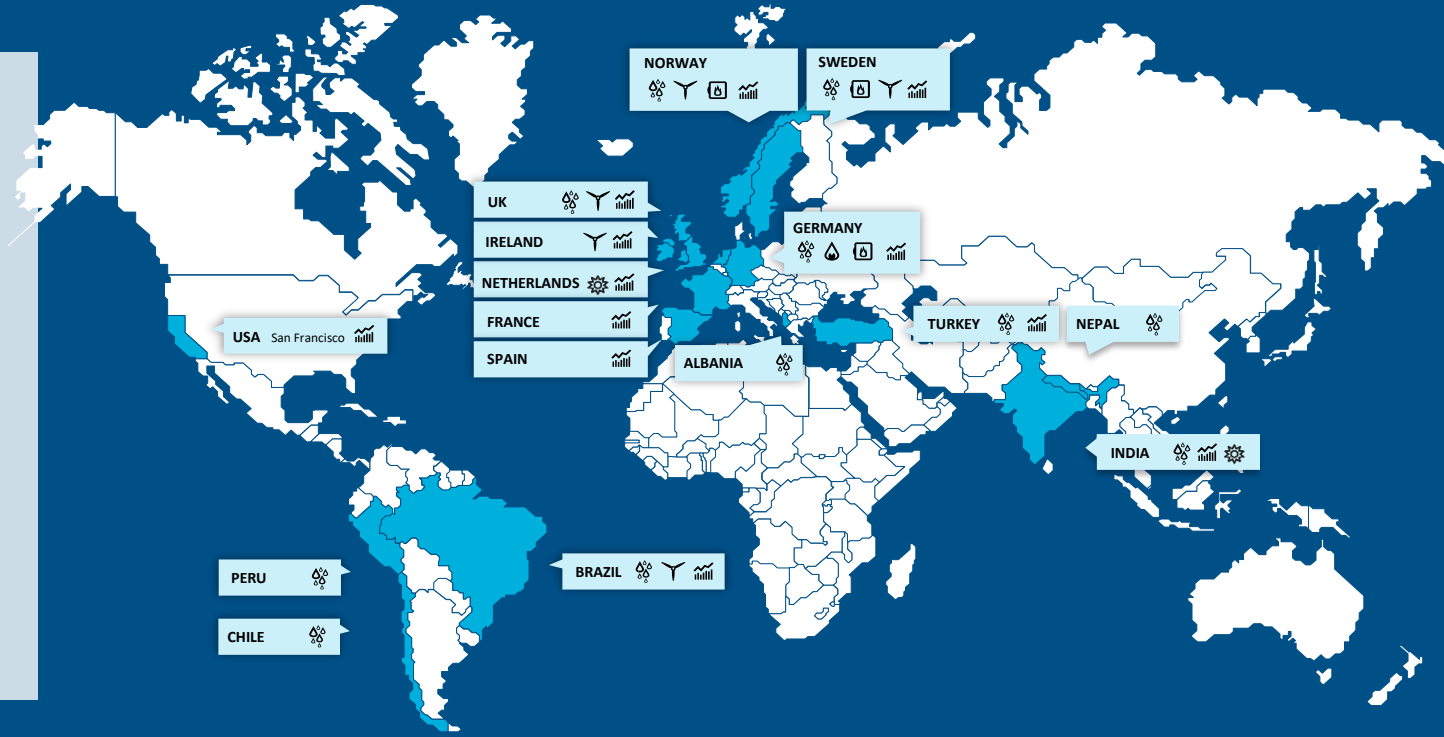
62 TWh

EMPLOYEES

3 600

NET PROFIT

13.4 NOK billion



Three main challenges in current operation

Aging assets

1/3 of the work force retires within 10 years

Challenging market conditions

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Start Simple to Gain Insights

Maintenance Teams

“Source of information”

- Dashboards trends
- Traffic light system

- Correlations of interest
- New sensor needs

- Condition monitoring, predictive models
- Virtual sensors replace static traffic lights

Task Force Advanced analytics

- Discover patterns in data
- Support with predictive models

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Dashboard Solution Hydro

- Objectives
  - Try out trend tool PI Vision
  - Design and implement dashboard for 2 hydropower plants
    - General overview signal
    - Early detection system
  - Create a generic template to ease rollout to new assets
- Strategy
  - Sprint developement
  - Small scope
  - Deploy and test
  - Change according to feedback and then expand

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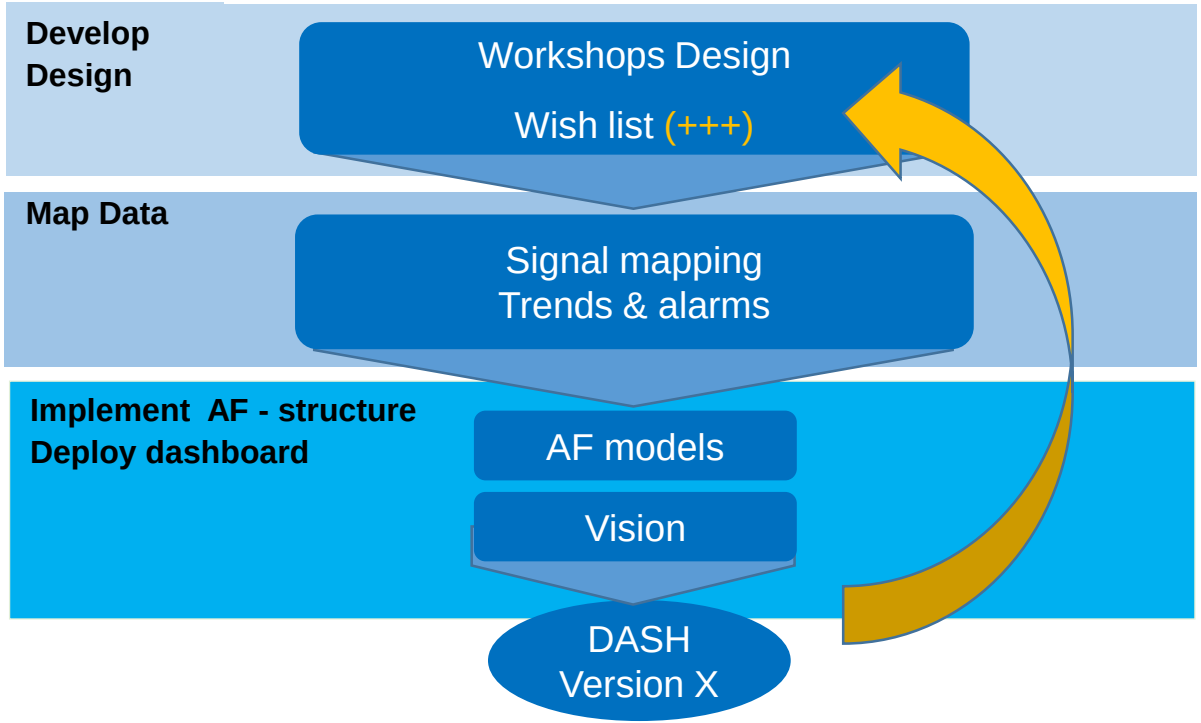
Approach



Basic

- Overview signals
- Traffic light system

Testing features

- Notification to SAP PM
- Logical functions
- More advanced calculation (Custom extension)
- Combining of data sources.

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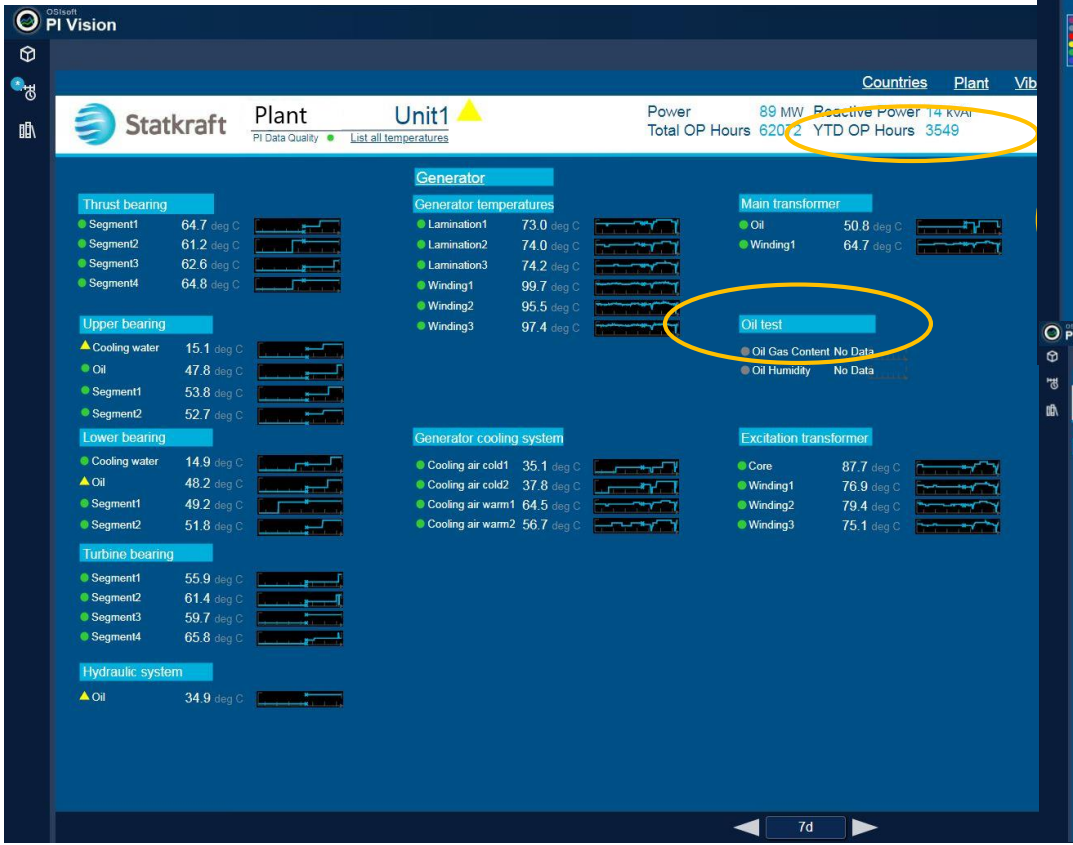
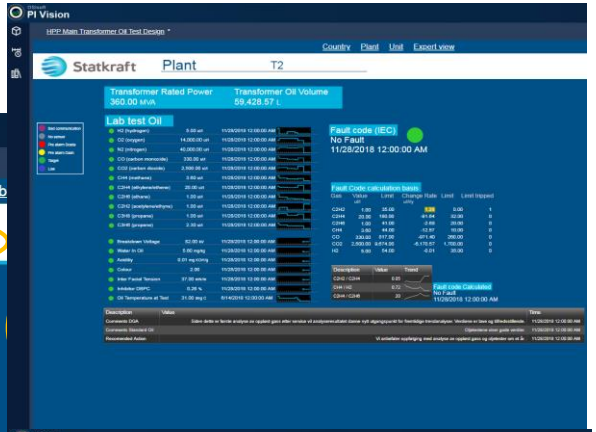
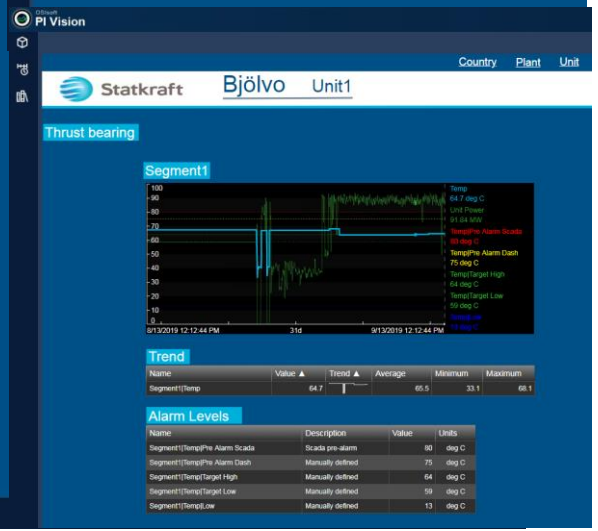
Unit Display







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Generator monitoring

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Conclusions and Going Forward

Tool

- PI Vision has proven to be stable, fast and flexible
- But not a plug and play tool
- Develop features to include

Business Value

- Prove Business Value through Evaluation
- Expand scope – new customers
  - Discipline experts; dams, turbine, generator, transformer..
- When each sprint is successful roll out across fleet

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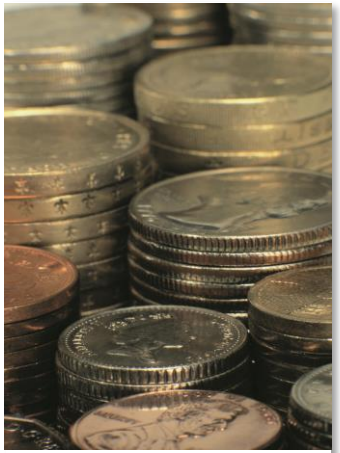
Digitalisation will have a positive impact on our KPI’s

HSSE

CAPEX



OPEX

MARKET ADJUSTED AVAILABILITY

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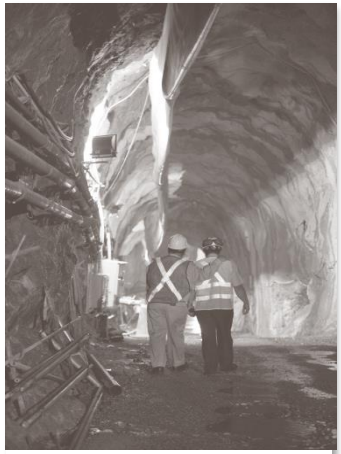
What if this picture is relevant across the portfolio?

Faulty Stator: costs and risks



HSSE

Generator investment 35 years earlier than planned

30 units (same generation and supplier) at risk

CAPEX

Minor fault: Unforeseen corrective

Risk mitgation action: Planned maintenance:

OPEX

Operational restrictions

Forced outage

Planned outage

MARKET ADJUSTED AVAILABILITY

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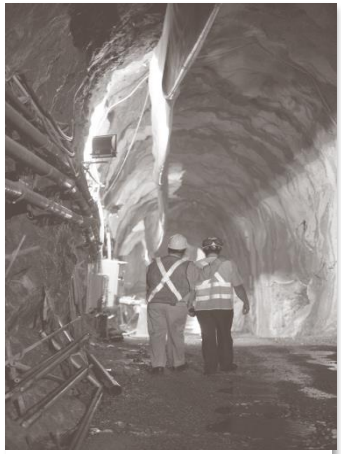
What if this picture is relevant across the portfolio?

Plant: Operational hours runner – calculated



HSSE

End of lifetime estimate based on operational hours according to load and no of start and stops (sensitive to fatigue)

CAPEX

Overview «true» hours until inspection.

Guarantee inspections after refurbishment and yearly controls

OPEX

Adjusted planned outage

MARKET ADJUSTED AVAILABILITY

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CUSTOMER STORY

Statkraft

CHALLENGES

- Low accessibility data
- Multiple data sources
- No early detection system for maintenance

SOLUTION

- PI System
- Dashboards maintenance teams
- Task Force advanced analytics

BENEFITS

Qualitative

- Changing ways of working «5S for data»

Quantitative - 6 months testing in 2 maintenance teams

- 14 minor improvements
- 1 failure development to monitor
- ++ new inquiries

> We have seen the engagement rise with the maintenance teams when we supply them with the information and tool the need in order to have the component condition inight they wish. Sometimes hard to quantify the value across fleet, but we believe the potential to be substantial when we use data in a structured way

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Artificial intelligence, Machine learning, Blockchain, Algorithms, Robotics, Big data…

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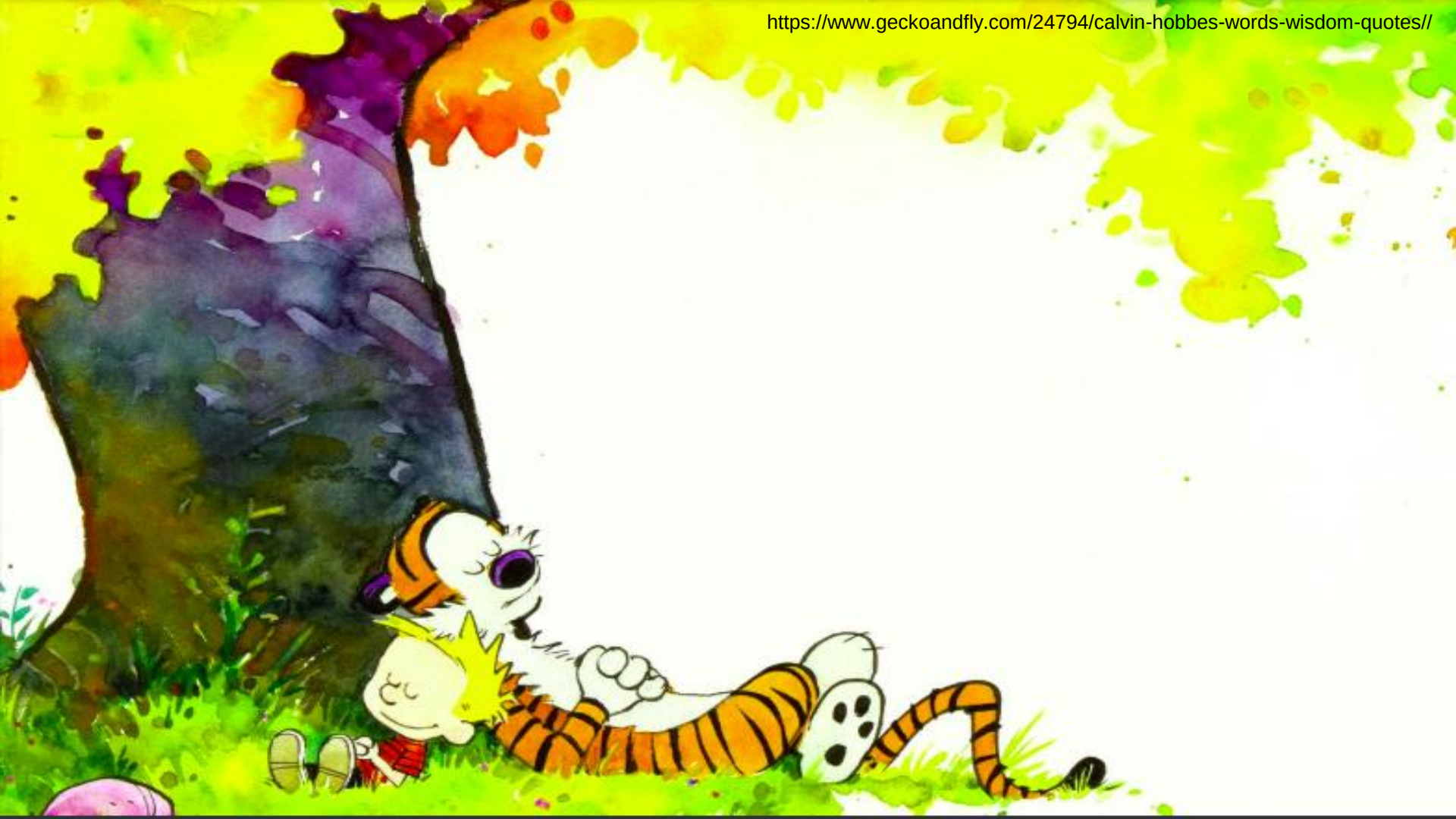
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Thank You

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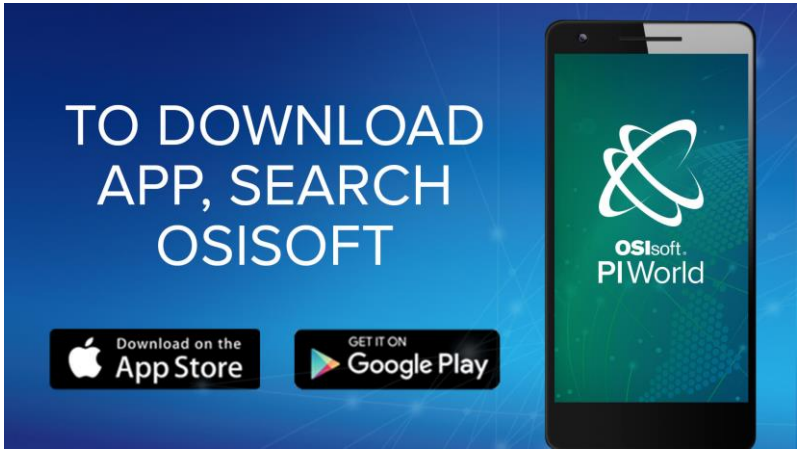

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