turboreflex
power plant technology upgrades

ETN Webinar Series
FLEXIBLE POWER GENERATION
March 2nd, 2021, 12am-1pm CET

# Condition based monitoring of turbomachinery components


## Alexander Wiedermann, MAN Energy Solutions



"TURBO-REFLEX. TURBOmachinery REtrofit enabling FLEXible back-up capacity for the transition of the European energy system"

# Tasks

**4.1 Condition and efficiency monitoring system**

- Monitoring system based on analytics and test data
- Detection of critical operating conditions
- Prediction of maintenance intervals

MAN Energy Solutions

**4.2 Steam turbine monitoring system**

- Monitoring system for blade vibrations
- Monitoring and analysis tool for LCF
- Online rub monitoring system

Doosan Škoda Power

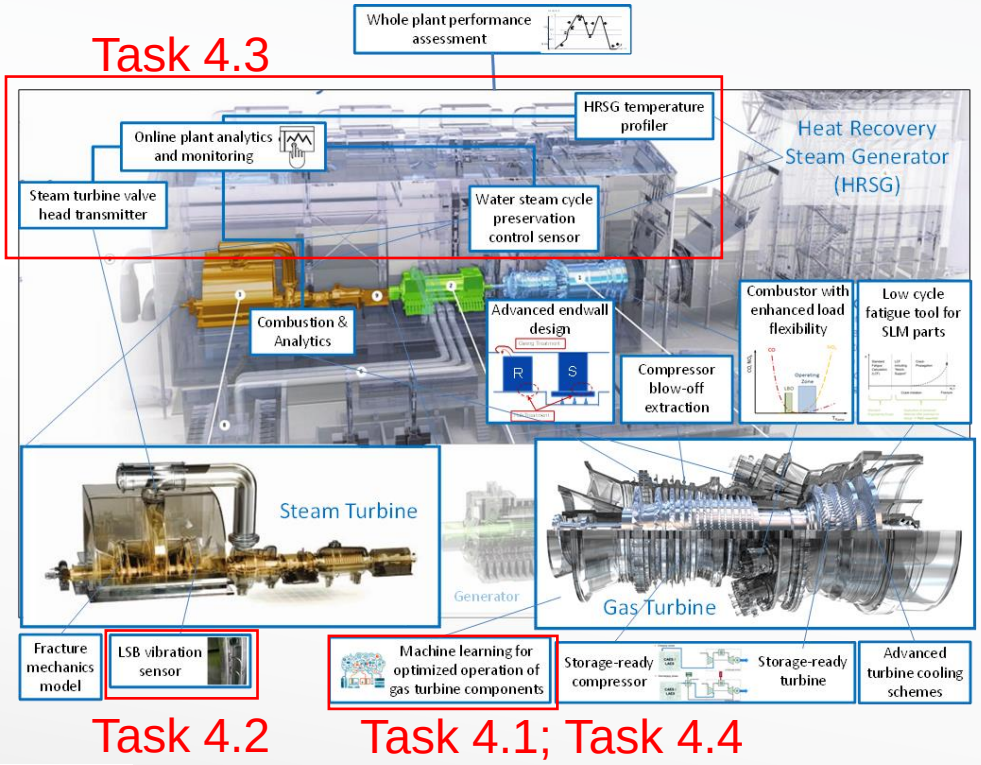
**4.3 Power generation analytics**

- Probes for plant components
- Plant monitoring system

**4.4 Machine learning on large heterogeneous data**

- Big data analytics methods
- Employ machine learning algorithms

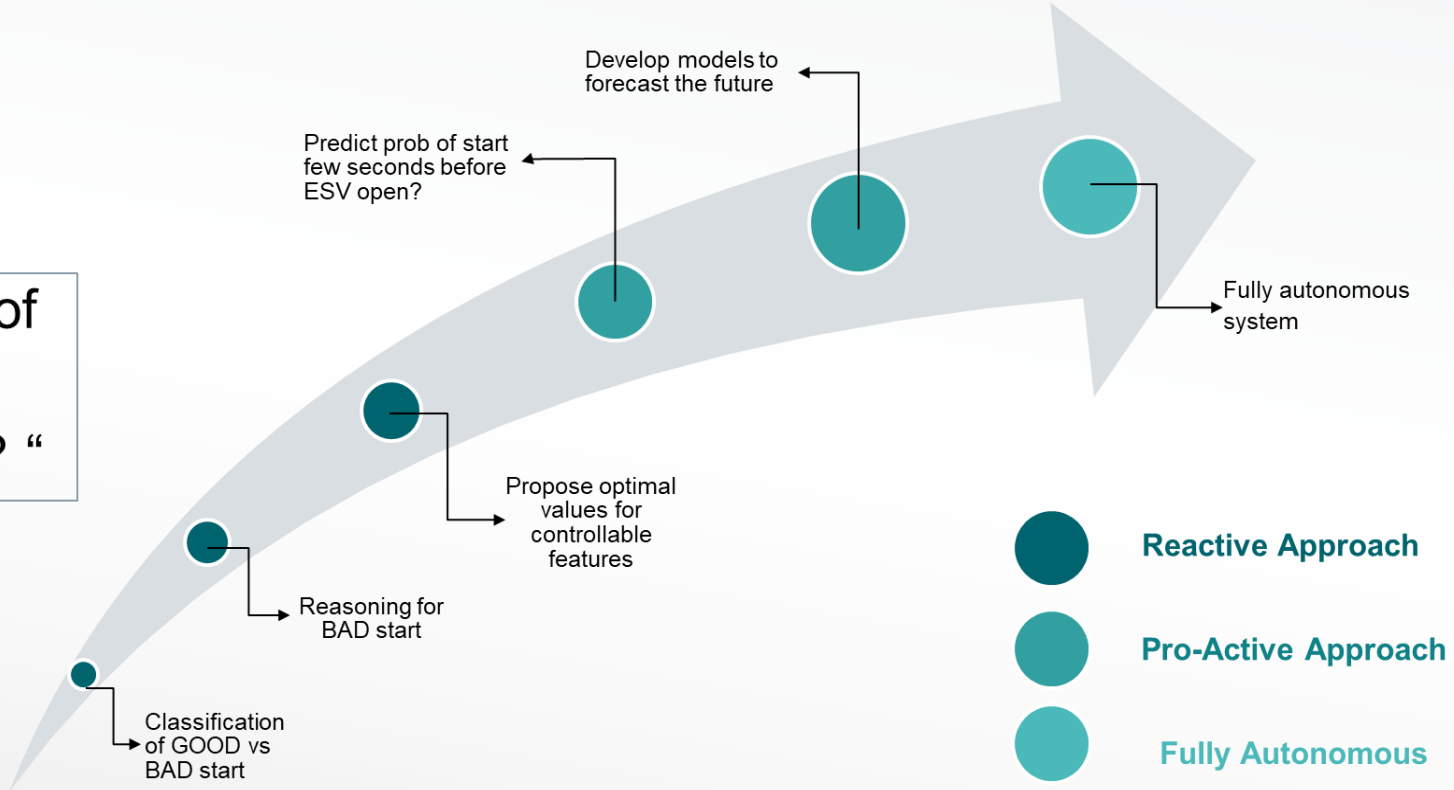
SIEMENS energy



# Condition based monitoring: Vision

## Vision

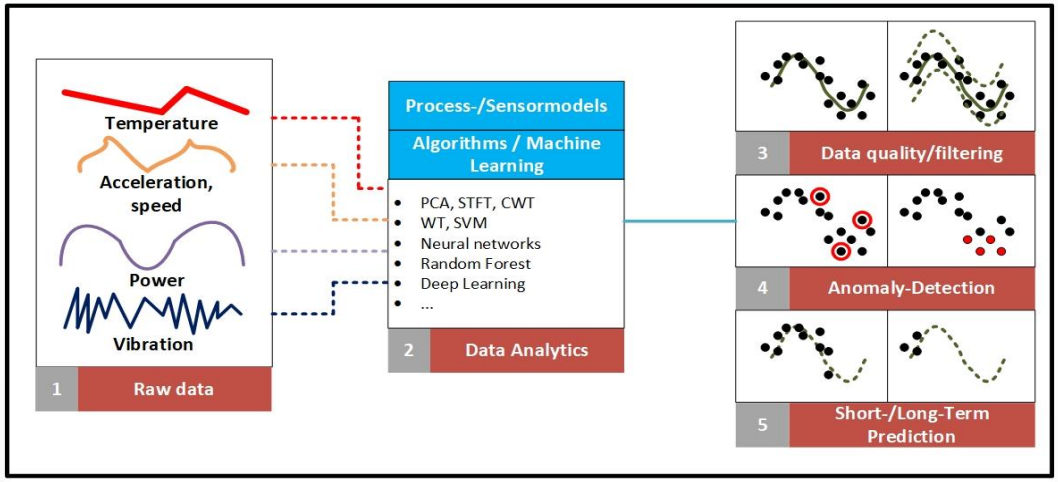
" What is of ***value*** to customer? "

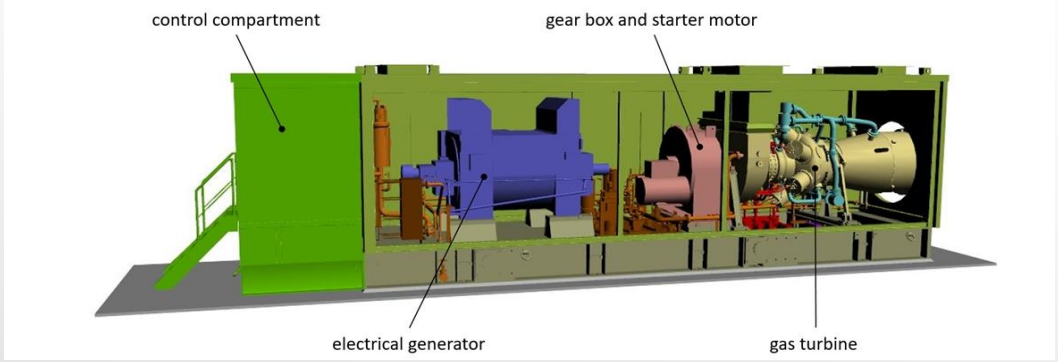


# CBM and ML: Approach

**“Machine learning on large heterogeneous data sources”**

- to develop and use plant physics models to optimize flexibility improvement strategies
- to prepare, implement and validate problem specific machine learning algorithms and feature tailored methods




**Synopsis**

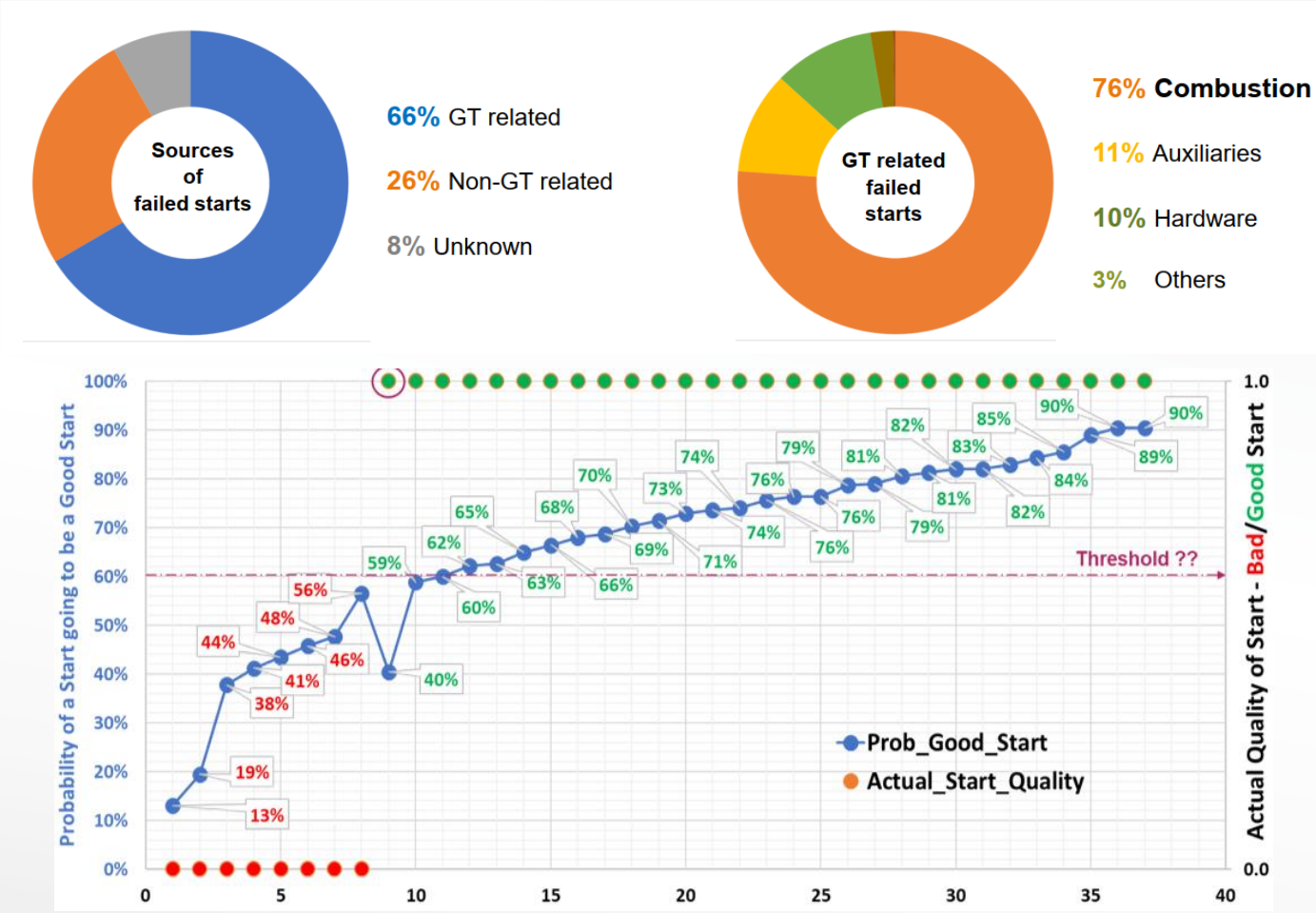
PCA: Principal Component Analysis

STFT: Short Time Fourier Transform

CWT: Continuous Wavelet Transform

SVM: Support Vector Machine

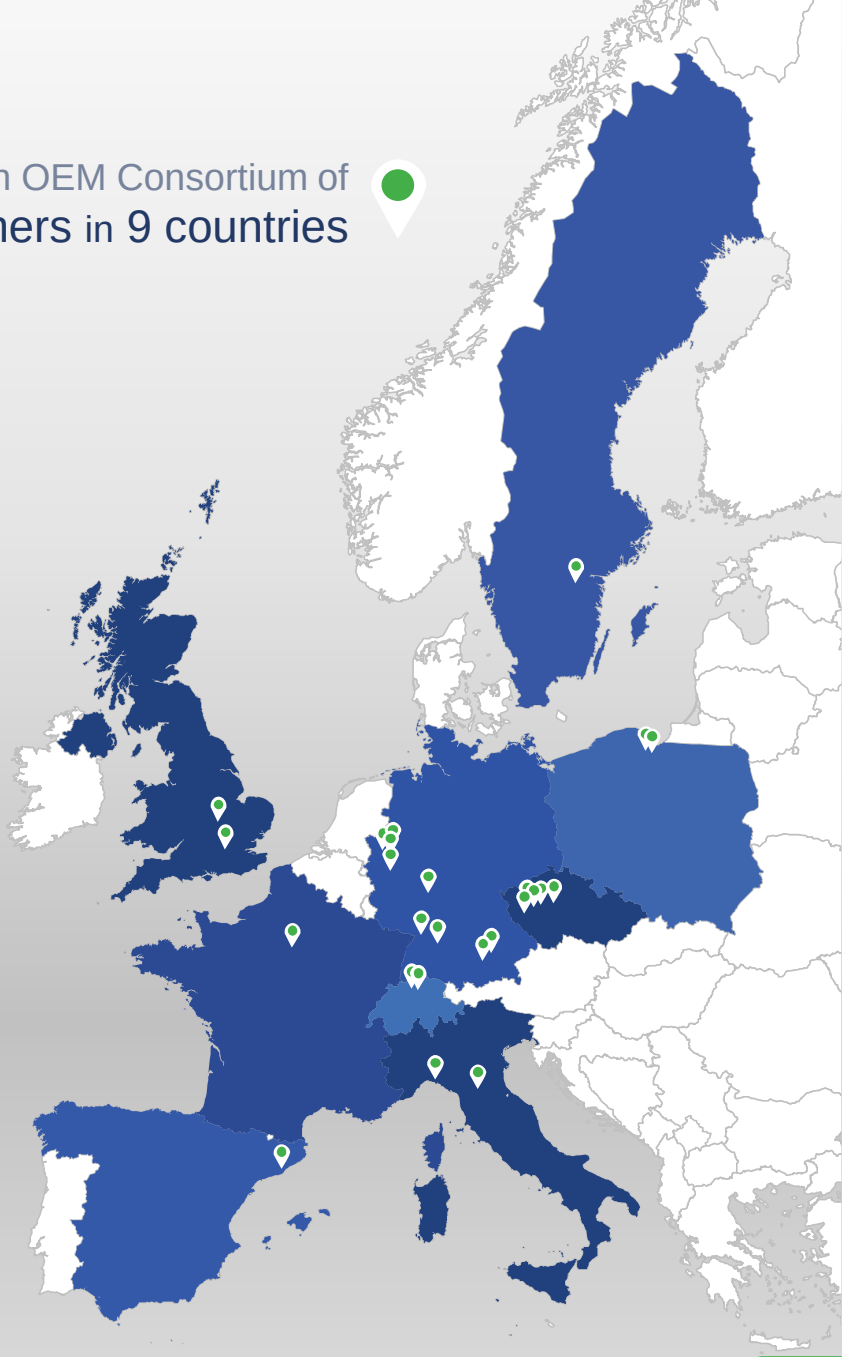
# Example: GT Start-up failures




Predictive capability of a trained CNN- Model (Convolutional Neural Network): Probability figures show the ratio of true vs. false predictions for each difference image

turboreflex
power plant technology upgrades

An OEM Consortium of
25 partners in 9 countries




Contact person:
Alexander Wiedermann

Phone:
00 49 208 692 2238

Fax:
00 49 208 692 2958

Email:
alexander.wiedermann@man-es.com