



Low and medium voltage service – April 2014.

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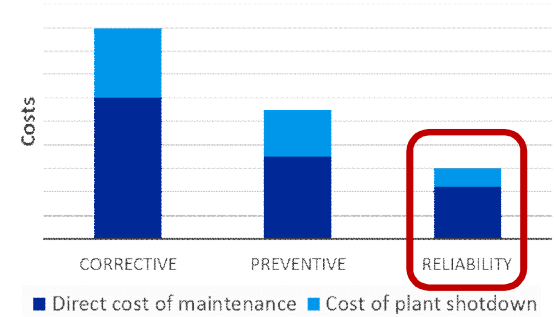
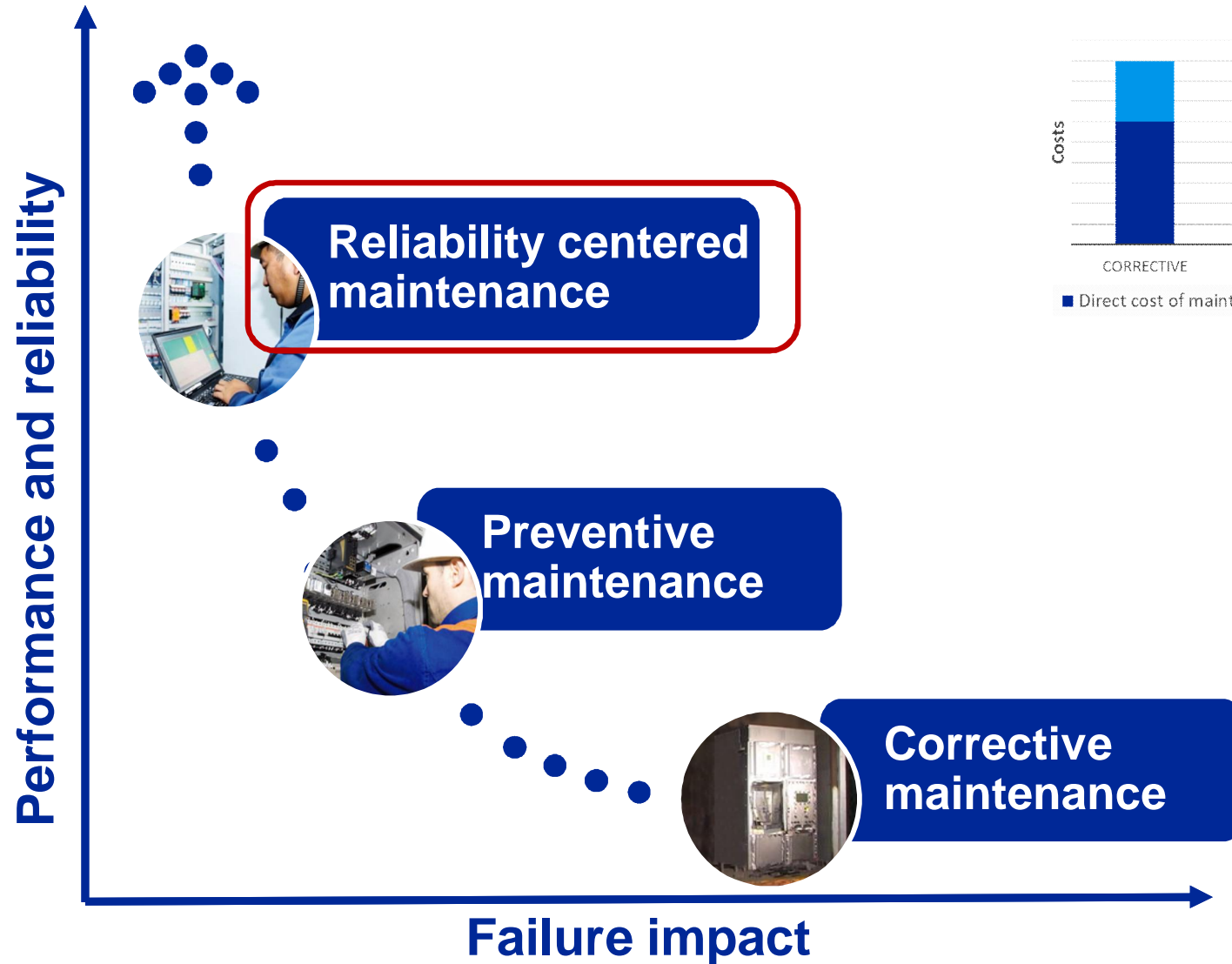
Your way to Reliability Centered Maintenance

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- Maintenance strategies
- What is “Reliability Centered Maintenance” (RCM)
- How does “MySiteCondition” support RCM
- Process of “MySiteCondition”
- Reduction of outage times and associated cost savings
- Summary

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Different maintenance strategies



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What is “Reliability Centered Maintenance” (RCM)

“...a process used to determine what must be done to ensure that any physical asset continues to do what its users wanted it to do in its present operating context.” - John Moubray

- A RCM strategy prioritizes maintenance resources toward assets that carry the most risk if they were to fail.
- Determining the most economical use of maintenance resources.
- Maintenance effort across a facility is optimized to increase reliability
- A RCM strategy is based on:
 - Risk and condition assessment
 - Maintenance planning based on the condition.

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Why use “Reliability Centered Maintenance”



- Switchgear lineups and the downstream equipment are strategically critical for production
- Maintenance of the switchgear lineups is an important task to control and mitigate risk.
- Finding an answer where to allocate operational budget
- MySiteCondition offers strategic advantages to always be a step ahead of the risk and in a comfort zone regarding the reliability of the power network.



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Further reasons for assessments

Also assessments are mainly used for making intelligent business decisions on where to spend operational budget and to construct a framework for upcoming maintenance measures (RCM), assessments can also be helpful in different business situations:

- when a second opinion is required
- work that has been performed by someone else needs to be reviewed
- determination of the remaining usefulness or reliability of assets to support replacement decisions

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What can MySiteCondition offer?



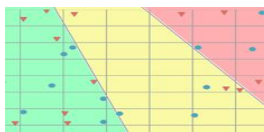
- A definition of the current asset condition with an outlook on current and future performance



- A documented and transparent decision-making framework that is needed for optimal allocation of the maintenance budget to reduce risk of failure.



- The identification of increased future risk and the mitigating effect of various intervention strategies



- The possibility to quantify and manage existing and upcoming risks

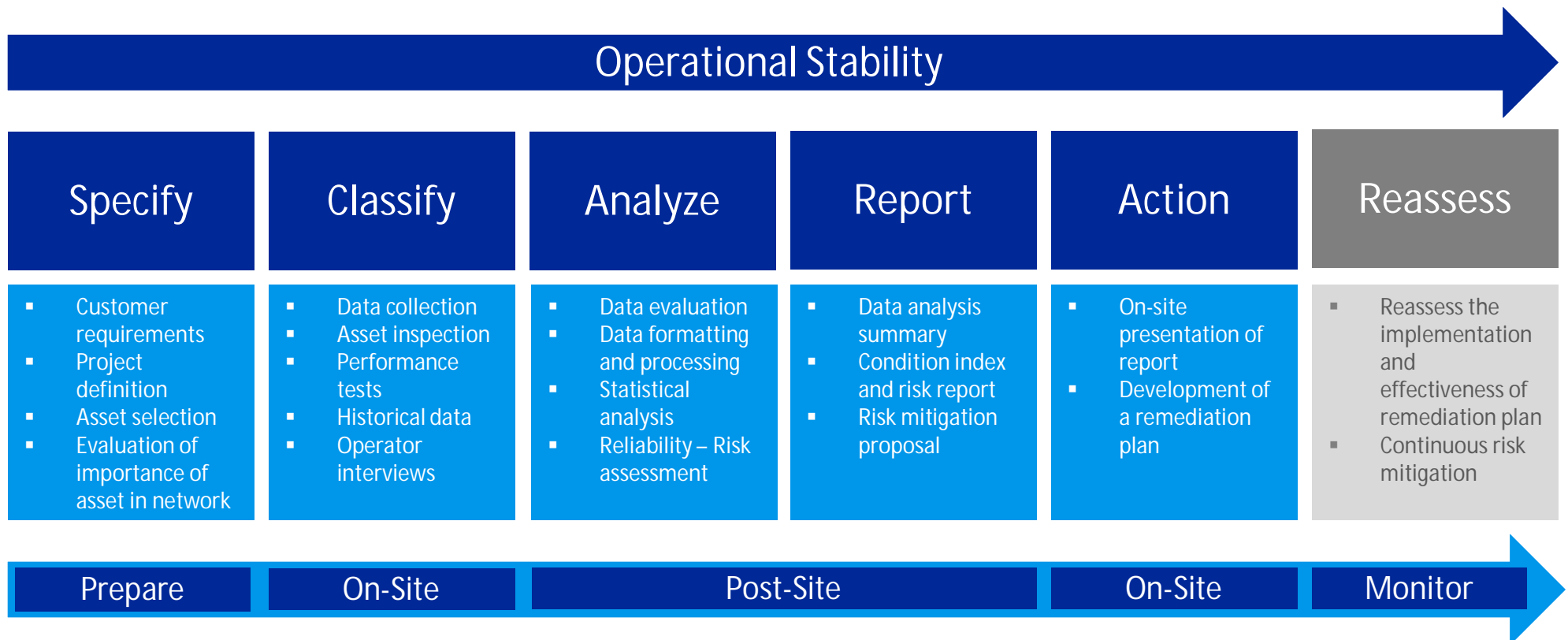
MySiteCondition Applications



- RCM based on MySiteCondition methodology can be used for any
 - MV equipment
 - LV equipment
 - Small transformers
- It approaches the reliability in a systematic way by analyzing the
 - risk of the equipment
 - importance of the asset
 - asset history

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The process



MySiteCondition Reports


Service Report

Data Analysis Summary

Project: Power Plant XYZ

CB-East 1E-STG22 Breaker

Manufacturer: GE 2/27/1975
Model:
Rating: ANSI kA, K=1/1200 A/15 kV/100 MVA
Last Overhaul: 8/24/2011
Routine Maint.: 8/24/2011 256A8610-002
Serial Number: 256A8610-002



Important Level: 98.00 % **Condition Index:** .66

Mechanical

Criteria	Score	Weighted Score	Normalized Score
Age	37.000000	30.000000	2.608695
Service Interval	3.000000	2.429745	0.211282
% Rated Operations	0.000000	16.000000	1.391304
Manufacturer	1.000000	5.000000	0.434782
Interrupting Technology	0.000000	15.000000	1.304347
Mechanism Type	5.000000	25.000000	2.173913
Lubricant Type	3.000000	15.000000	1.304347
Inspection Complete	0.000000	30.000000	2.608695
Cleanliness	0.000000	25.000000	2.173913
Other Defects	0.000000	25.000000	2.173913
Trip Functions	0.000000	25.000000	2.173913

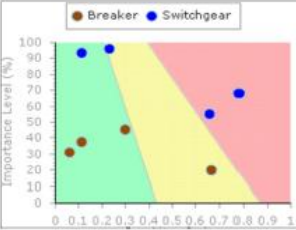
* Extract

Data analysis summary*


Substation SS-1

Description
 This substation contains 4 sets of breakers and switchgear from each side (Side 1 and side 2) in an environmentally controlled building. All circuit breakers are of 13.8kV ratings. The 2000A feeder breaker cell was converted in 1999 as cell-in-cell retrofit using draw out circuit breaker OEM cubicle with adapter bus and disconnects to match the existing primary bus stabs and draw out versions of the new circuit breaker. This assessment focuses only on side B, since the old equipment in side A has been replaced by new ABB switchgear in late 2012.

Assessment



Current condition of SS-1



Current reliability of SS-1

Asset ID	Type	Condition Index	Reliability
CB-1	Breaker	0.66	34%
CB-1A	Breaker	0.06	94%
CB-1B	Breaker	0.11	89%
CB-1C	Breaker	0.29	71%
SG-1	Switchgear	0.23	77%
SG-1A	Switchgear	0.78	22%
SG-1B	Switchgear	0.11	89%
SG-1C	Switchgear	0.65	35%

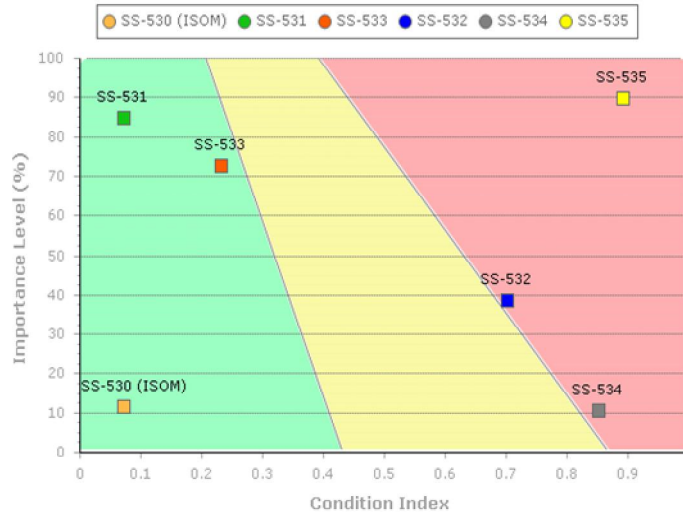
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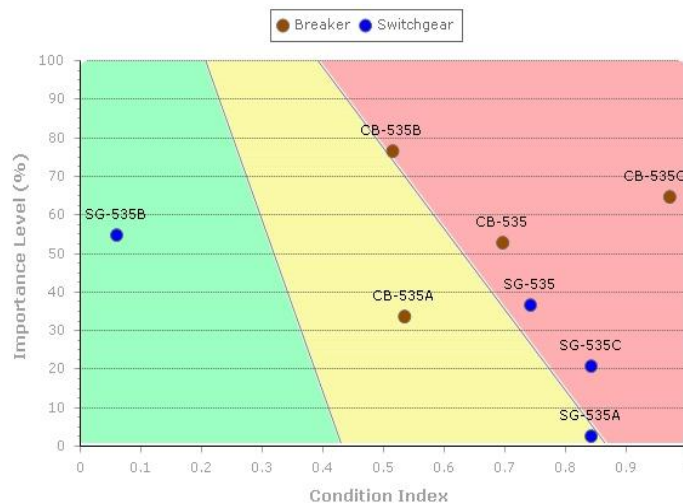
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Extract: Substation report



- Overview of the current condition of each substation on the plant, linked to its importance.
- Provides first idea where to invest the operational budget.

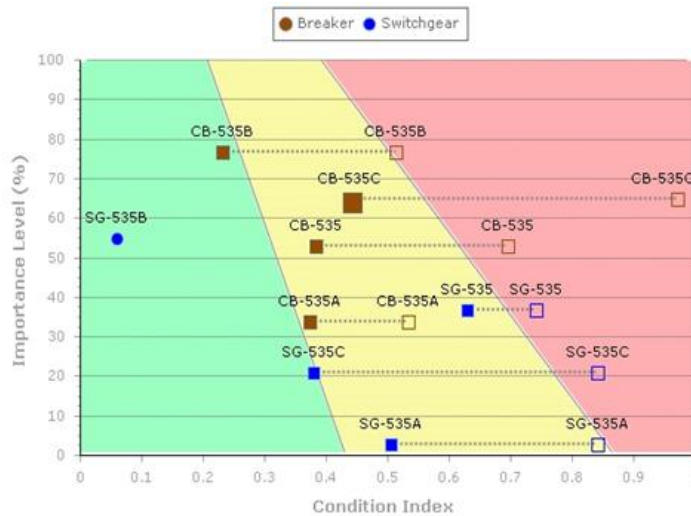


- Assets in one substation
- Maintenance efforts can be directed on asset basis.
- Operational budget is only used where asset and system reliability are endangered.

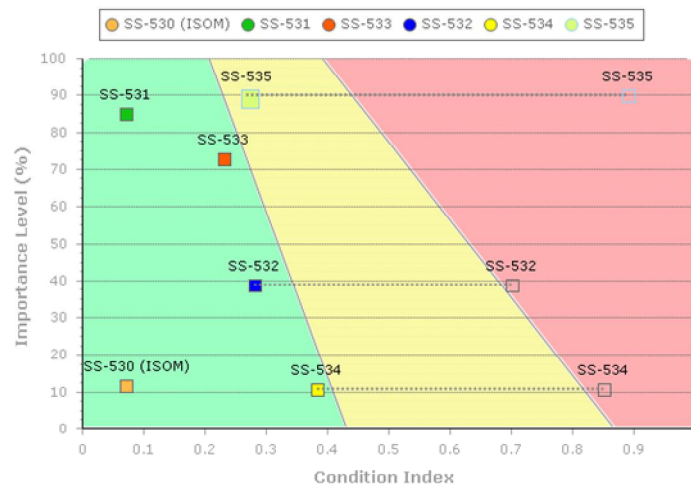
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Example: Risk mitigation actions

The improvement on the assets was achieved by properly allocating the funds on maintenance and upgrade measures. By further investments, the status could be additionally enhanced.



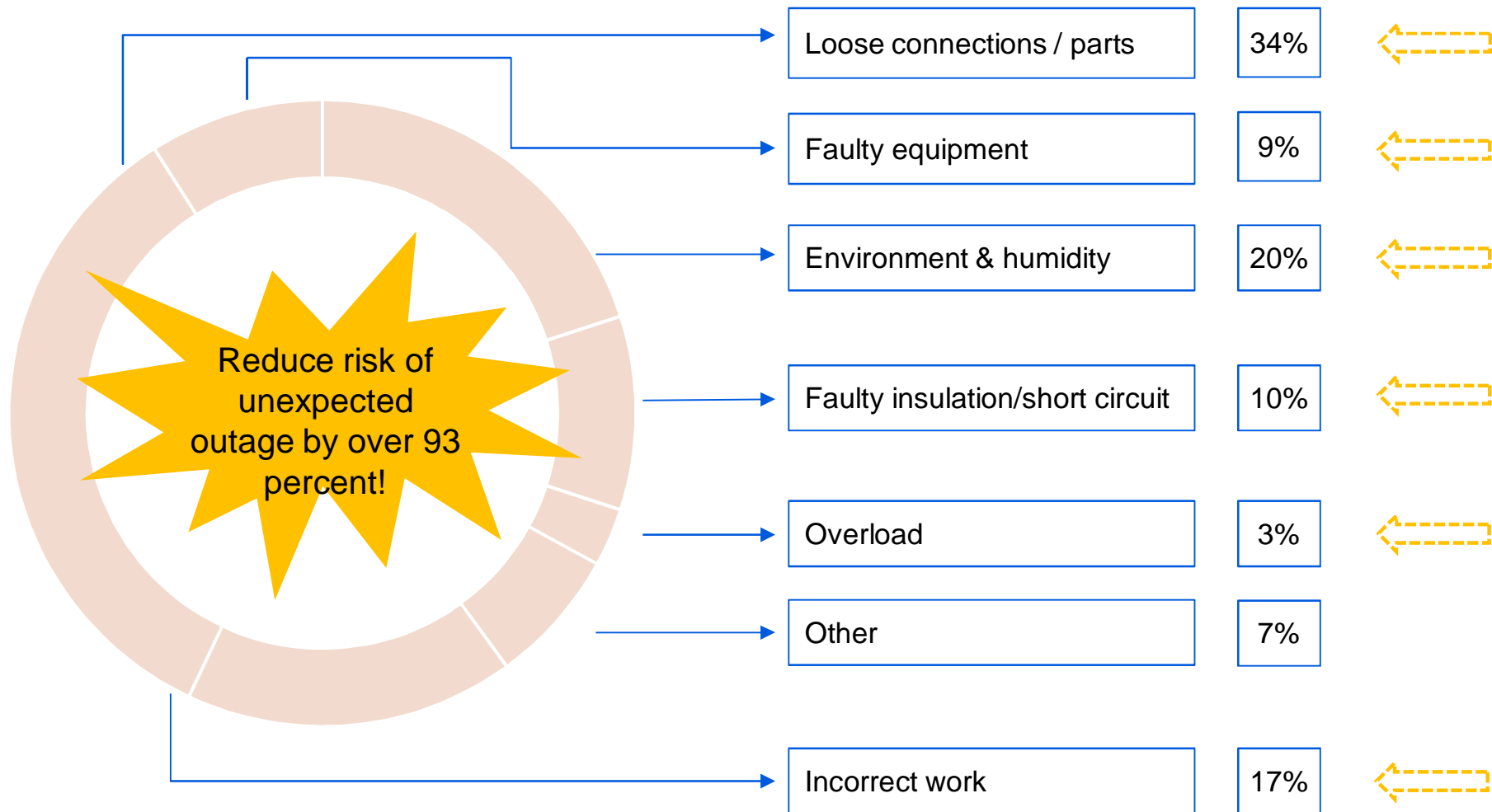
- Based on the report ABB will recommend measures to increase reliability, reduce risk and improve safety.



- By carrying out these measures in course of a RCM approach the overall equipment and substation condition will be highly improved.

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Reduction of unexpected outages



Source: Hartford Boiler Steam

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Side information: Average outage costs

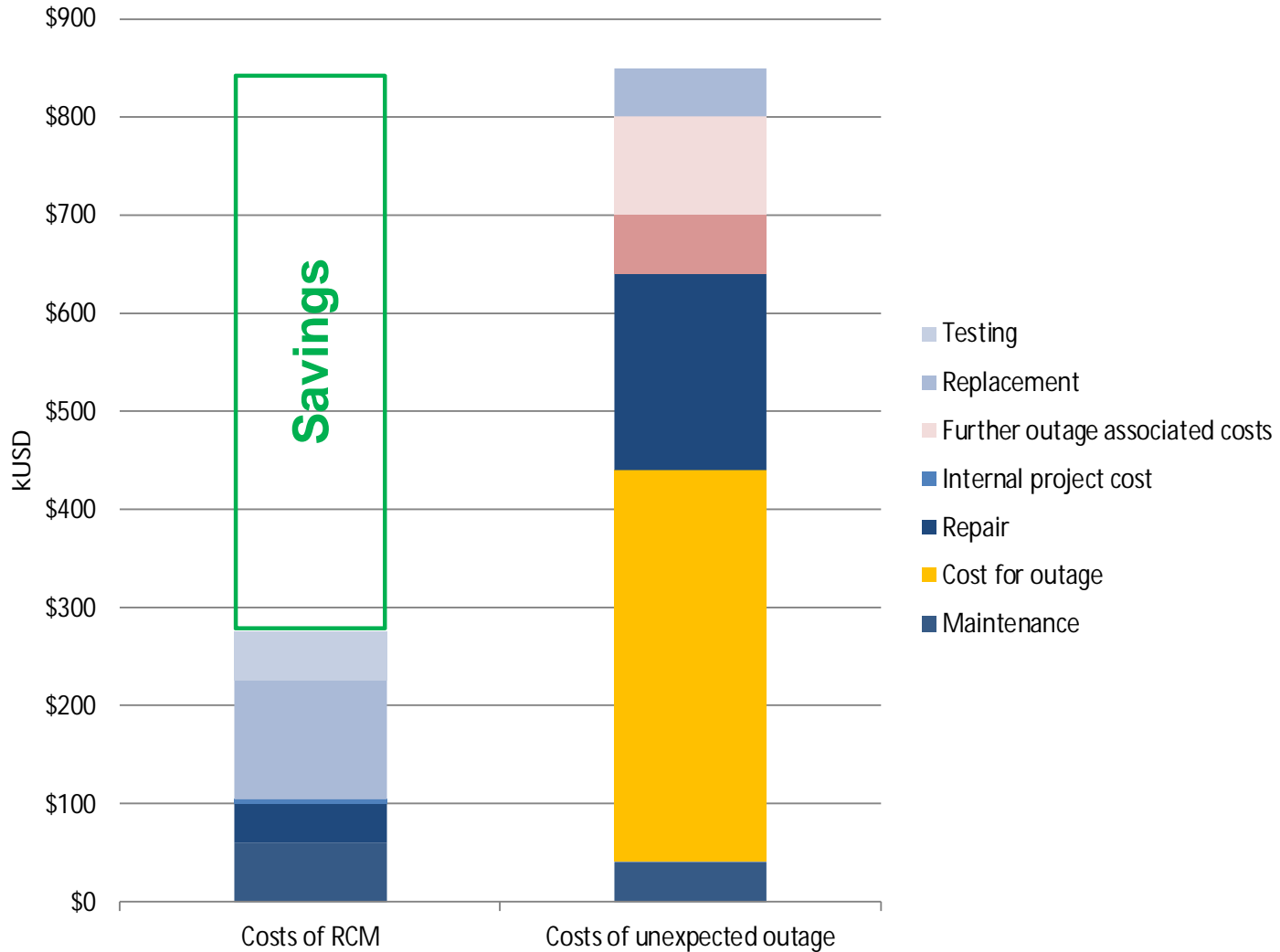
Industry	Average outage costs / hour*
Paper & pulp	13 kUSD
Brewery	13 kUSD
Automotive	40 kUSD
Power plant	120 kUSD
Airline reservation center	125 kUSD
Petrochemical	130 kUSD
Mail order business	140 kUSD
Tobacco	520 kUSD
Data center	630 kUSD
Copper mill	3,250 kUSD

Based on a study from 2003 and Contingency Planning Research

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Total costs of RCM over 5 years

Exemplary costs
of a big industrial
site with several
substations;
outage costs
100kUSD/h,
outage duration
4hrs*



*based on ABB
experience

MySiteCondition Summary

- MySiteCondition provides a detailed report that shows and explains
 - how reliability can be improved
 - availability increased
 - maintenance needs prioritized
- First improvements can be performed as data is collected and will have immediate impact on condition of the equipment.
- Studies have shown that up to 25% of the maintenance budget can be used more effectively by performing assessments in order to prioritize and focus.

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