

# The 2019 General Meeting and PIESA-IERE South Africa Forum

Electricity & the 4th Industrial Revolution  
– an Africa perspective



October 28 - 31, 2019



# SYSTEM SOLUTIONS FOR ASSET MANAGEMENT

The open standard for the digitalization of transformers

19 June 2019

Mr de Villiers

MR



# INTRODUCTION

(MR)\* is a world-leading manufacturer of on-load and off-circuit tap changers for power transformers. The company also provides plant equipment such as diverter switches, motor drive units, voltage regulating systems, supervisory equipment, oil filter units and monitoring solutions for on-load tap changers (OLTC).

Our services is to manage, analyse, maintain, repair and offer training and consultancy solutions.

We deliver premium services such as asset retrofitting, installation, commissioning, moisture management and autonomous automation of substations.

Decades of expertise and innovation in all areas of voltage regulation.

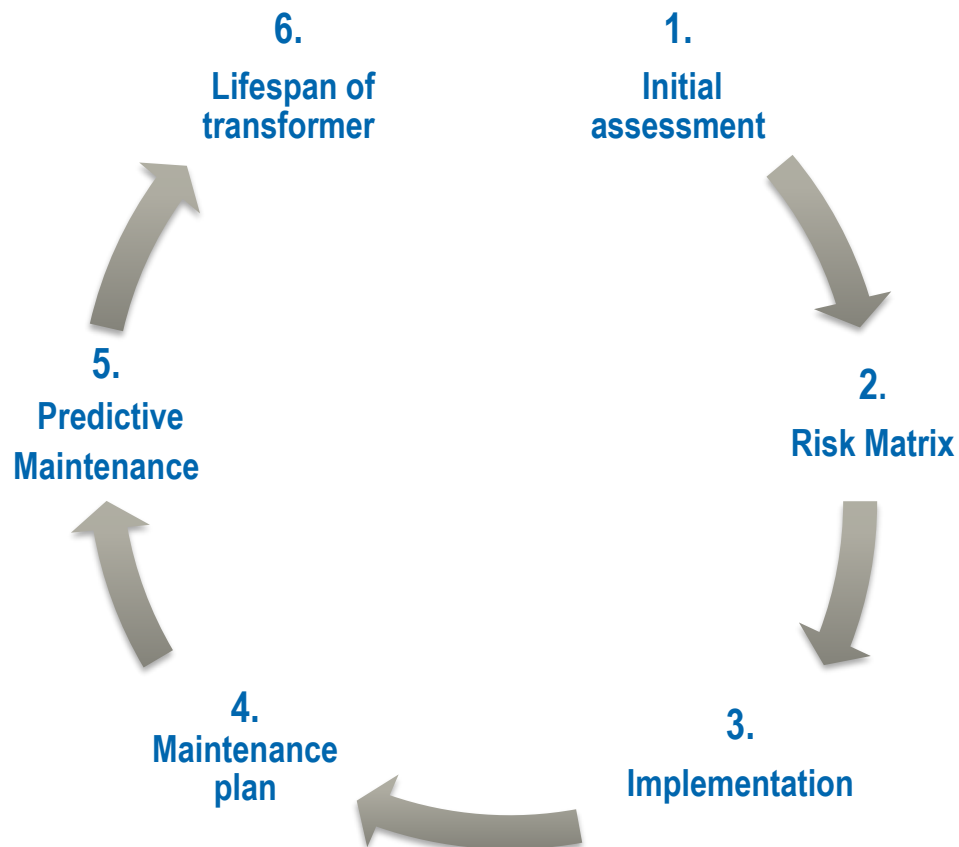
Develop important energy solutions, which help improve the global energy supply.

Customers include the manufacturers of high-voltage systems, transmission and power distribution grid operators, including large electricity users.

Reinhausen South Africa (Pty) Ltd is a 100% subsidiary of the German-based (MR)\* and the sole agent for (MR)\* products in Sub-Saharan Africa.

Based in Johannesburg and have branches in Cape Town, Kwazulu Natal, Mpumalanga, North West and Southern Africa.

# THE FOURTH INDUSTRIAL REVOLUTION IN ASSET MANAGEMENT OF POWER TRANSFORMERS



## 1. Initial assessment of the transformer

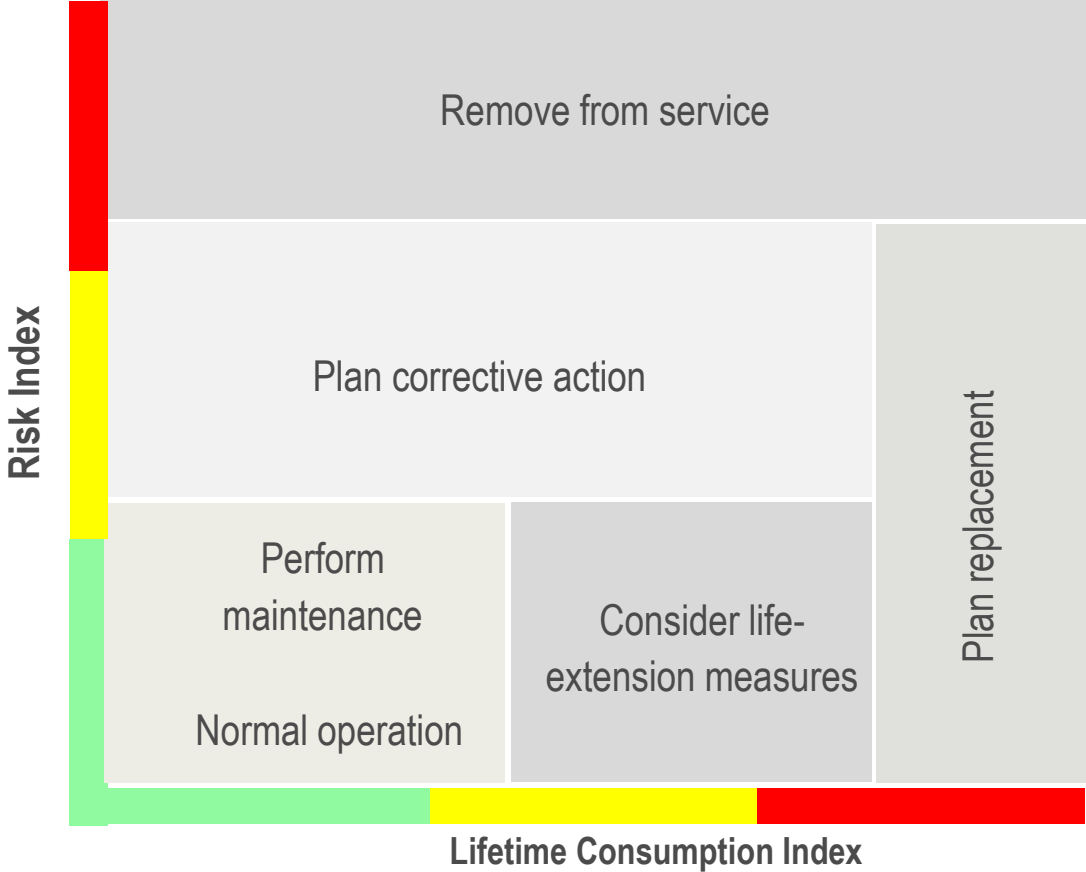
- | Initial on-site assessment, the aim is to establish the condition of a transformer
- | Factors to consider: Calculate/estimate, determine remaining life time
  - Define the system
  - Identify failure modes
  - Analyze failure effects
  - Determine causes of the failure modes
  - Feed results back into design process
- | Review and clarification of data sources, interfaces and communication channels
- | Perform elaborate measurements on site, HV and LV tests
- | DGA
- | Bushing tests
- | OLTC operational tests
- | Voltage regulation tests
- | Cooling systems control and protection functionality test

## 2. Risk matrix of the transformer

| The outcomes of the initial assessment will assist the asset manager to place the transformer on a risk matrix.

- Classify risks
- Rank failure mode criticality and determine highest risk items
- Take mitigation actions and document the remaining risk with rationale
- Follow-up on corrective action implementation/effectiveness

# RISK MATRIX



### 3. Implementation

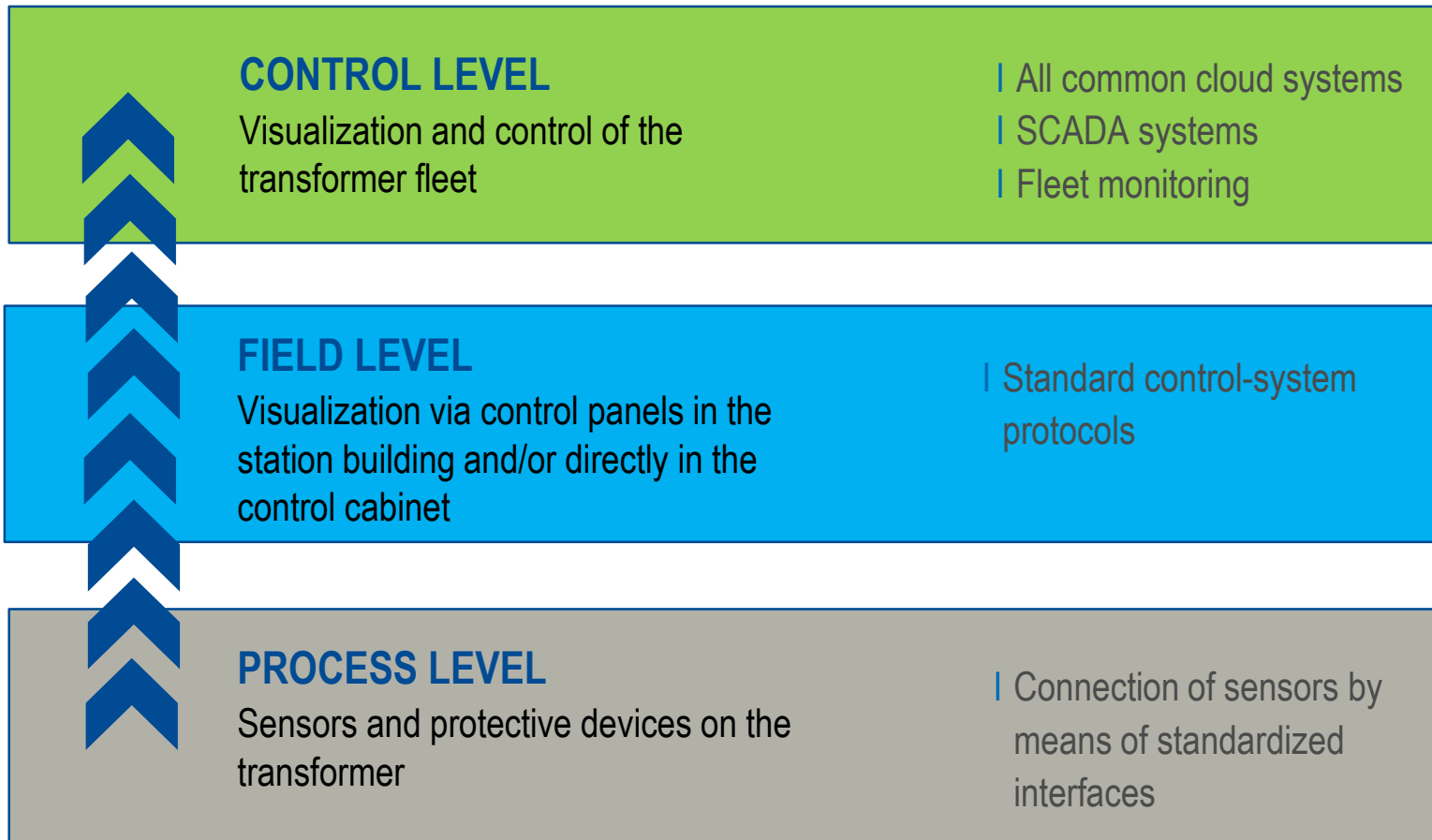
#### | Implementation of monitoring devices

Includes the following:

- Monitoring and protective devices
- Intelligent sensors
- Field devices for control
- Regulation and monitoring
- Communication accessories



## Monitoring devices



#### 4. Maintenance plan of the transformer

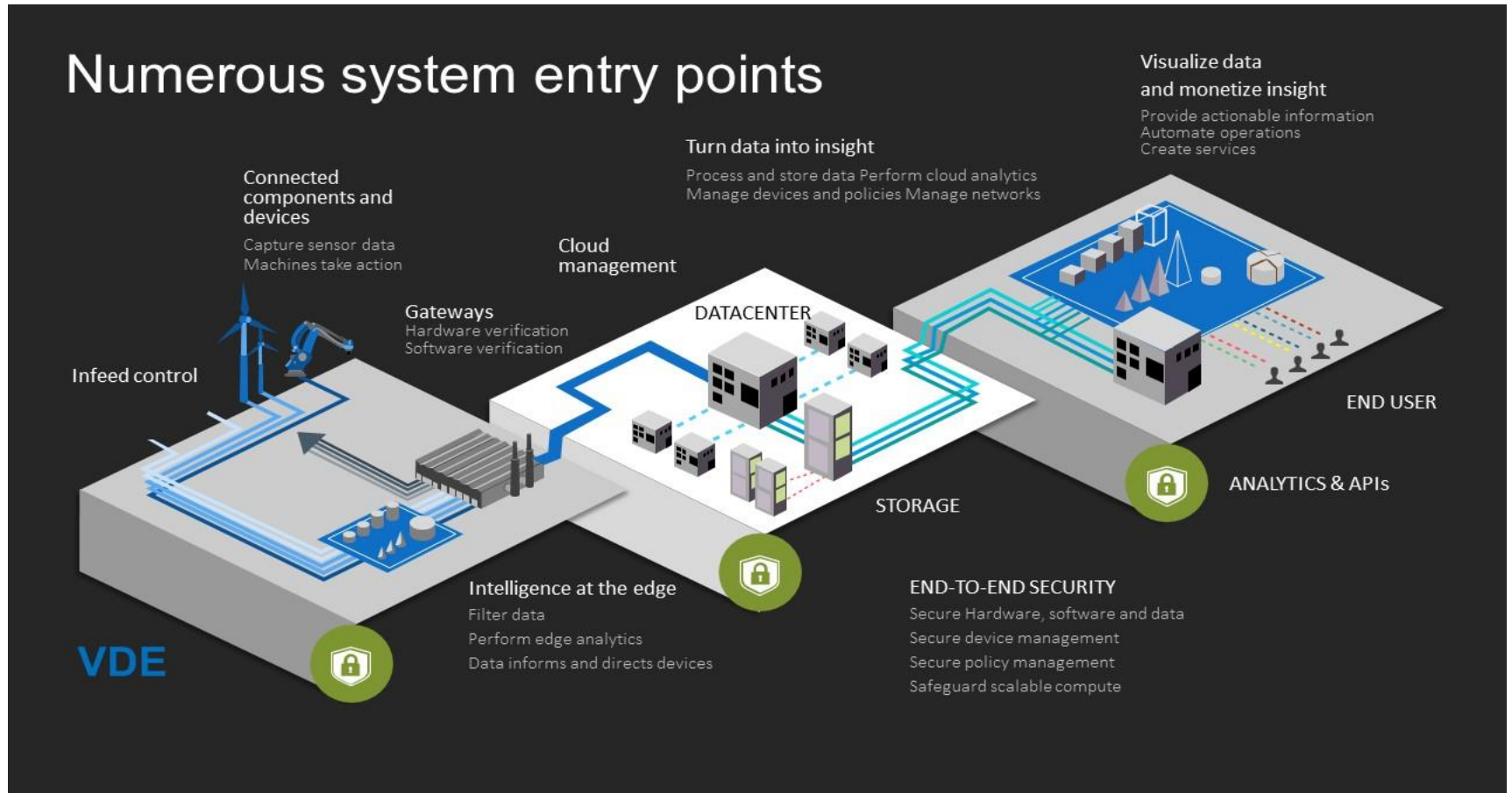
I Determine the project and maintenance plan on remainder of transformer life

- Thermal imaging of transformer every six months
- DGA analysis
- On-site visual inspections every three months
- Real time monitoring of installed monitoring devices
- Predictive maintenance

# MAINTENANCE PLAN

## 4. Maintenance plan of the transformer

### I Challenges of System Risk Mitigation



# MAINTENANCE PLAN

## 4. Maintenance plan of the transformer

### I 360° VDE Cyber Security Shield



## 5. Predictive maintenance of the transformer

- | The growing number and greater average age of power transformers, and increasingly more demanding technical requirements on monitoring, control and regulation, are presenting growing challenges for the work of asset managers and grid management.
- | In order to efficiently operate and maintain existing systems and prevent critical errors on power transformers, the right solution must be at hand.
- | Assisting in equipment evaluation and decision-making
- | Periodically checking system integration and databases
- | Analysis of the recorded data/equipment and measures derived from it



# PREDICTIVE MAINTENANCE

- | Condition monitoring solutions require time, skills, technologies and solutions as things get more connected, less critical operations are included, thus cloud based predictive maintenance is growing faster
- | Assisting in equipment evaluation and decision-making
- | Periodically checking

## 6. Lifespan of the transformer

### I End of life of the transformer

- Consider oil, paper
- Act according to environmental laws
- Get rid of copper steel

## Challenges in the development of advanced asset monitoring technologies

### **Neutral Standard**

Quality, legacy asset can become a liability if not handled properly  
Components faces danger to become obsolete. Lack of standards and different solutions and devices means more development and work thus higher costs to implement and scaled.

### **Systematic Security**

Must be seen as a clear and present concern to address holistically in Industry 4.0  
Cyber security in the Industrial Internet of Things (sabotaged, hacked, stolen)

### **Human Element**

Sabotage, theft, security in physical world

### **Consider the sometimes hard conditions in which monitoring devices need to operate**



# BENEFITS OF MAINTENANCE PLAN

## Maximum Operational Reliability

- | Monitoring of all equipment in real-time, 24 hours a day, 7 days a week
- | Trend monitoring and equipment comparison
- | Active asset management support through a condition-based maintenance strategy
- | Increased equipment service life
- | Errors are detected before a fault occurs
- | Central visualization of all connected transformers
- | Guarantees a detailed analysis in the event of a fault

## Cost advantages

- | Significantly lower investment costs of a modern connection of the embedded transformer operating systems to the control point by means of network protocol (fiber-optic cable) instead of a conventional connection via copper cables
- | Cost-effective elimination of defects only using GSM via predictive maintenance
- | Improve savings
- | Increase in equipment service life

# BENEFITS OF MAINTENANCE PLAN

## Easy and fast integration

- | Existing communication structure and devices can be used
- | Optional connection and analysis of information provided by the control system
- | Integrated document management and archiving

## Reduction in complexity

- | 1 System from 1 source
- | Easy integration into existing infrastructure
- | Simple connection of sensors and data sources from all manufacturers
- | Easy to expand

THE POWER BEHIND POWER.

[www.reinhausen.com](http://www.reinhausen.com)

