JULIO OLIVEIRA, ABB POWER GRIDS – GRID AUTOMATION, AUGUST 08TH

Gestão de ativos em subestações digitais

ABB Ability – Plataforma Ellipse

Brazil Windpower 2018 conference & exhibition

ABB

Agenda

- Os desafios correntes encontrados pelas concessionárias
- O cenário atual das subestações quanto à digitalização
- Estado da arte da norma IEC 61850
- Gestão de ativos na era das subestações digitais

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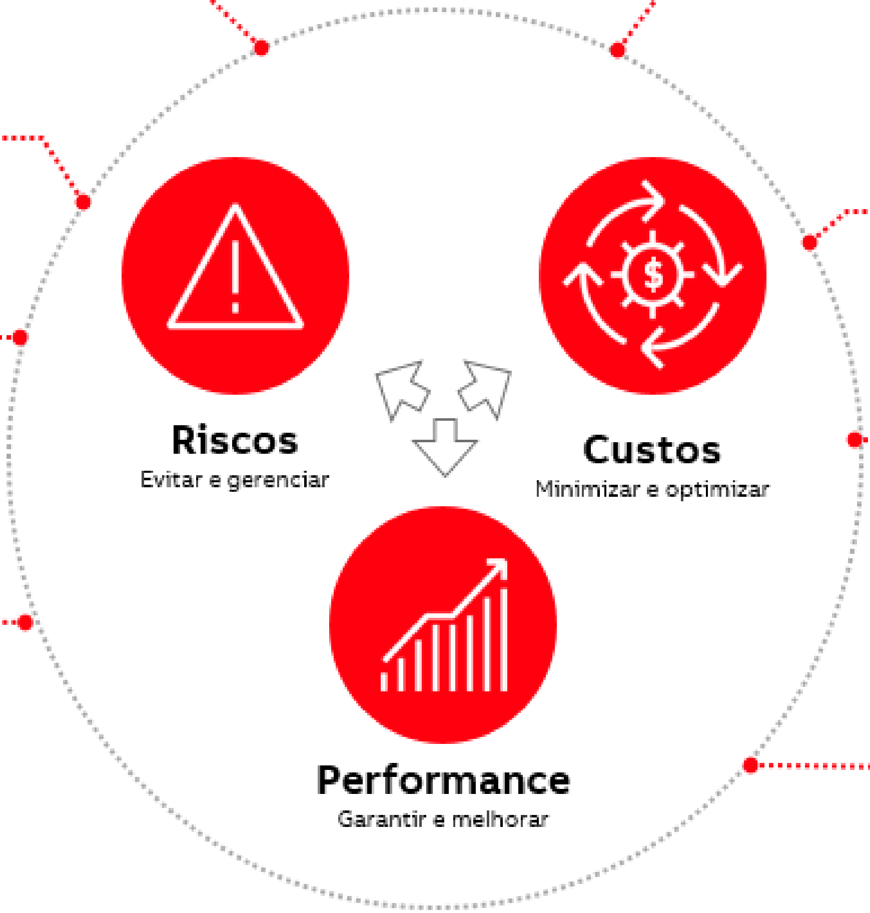
Os desafios correntes encontrados pelas concessionárias de energia

Envelhecimento dos equipamentos
Sistemas legados com relés eletromecânicos e sem telemetria

Confiabilidade
Aumento de número de falhas e gastos de OPEX (manutenção)

Tecnologias disruptivas
Técnicas de digitalização das subestações por meio da norma IEC 61850, preocupações com cyber segurança e gestão de ativos. Neste aspecto, é necessária maior atenção por parte das concessionárias

Mudança no modelo de negócios
Entrada de novos players no mercado, inclusive de empresas cujo o foco não é a área de energia. Estima-se que por volta de 2020 estes players serão responsávies por quase 20% da energia gerada e transmitida no mundo. Essa tendência deve ser seguida no Brasil também com novos acessantes.



Riscos
Evitar e gerenciar

Custos
Minimizar e optimizar

Performance
Garantir e melhorar

Transição na força de trabalho e capacitação
Uma parcela considerável dos grupos de manutenção/operação e engenharia elegíveis para aposentadoria. Novos funcionários requerem capacitação para manter o know-how.

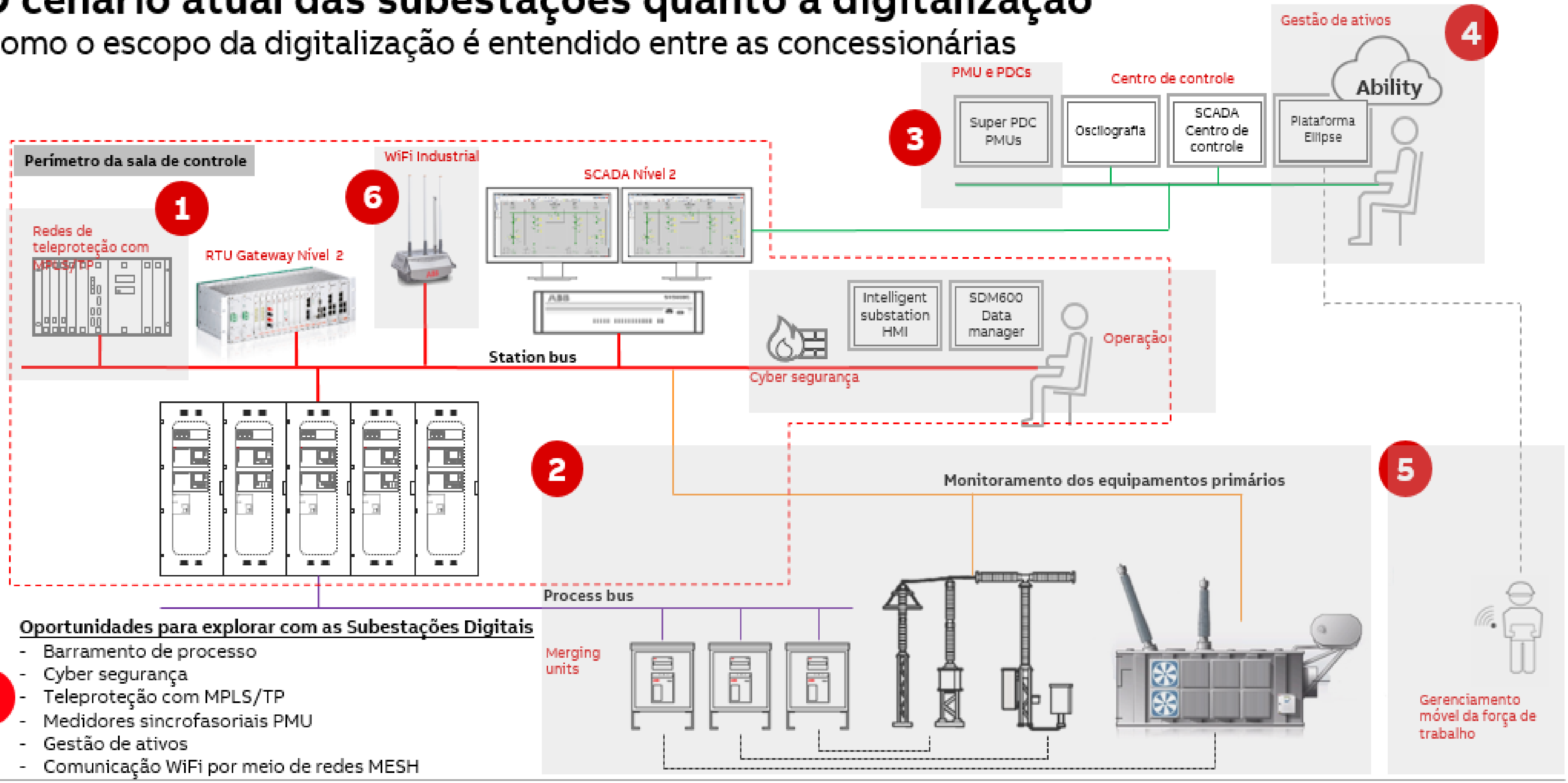
O&M
Redução de gastos com manutenção ao longo do período de concessão e busca pela eficiência com menores riscos operacionais.

Justificativa de investimentos
Desafios sobre a receita da empresa e como torná-la mais eficiente e auditorias para avaliação dos ativos, marcos regulatórios e tomada de decisão para CAPEX

Cyber segurança
Com redes cada vez mais conectadas e com IEDs e outros equipamentos inteligentes no grid, a preocupação em proteger informações da Eletrobras sensíveis contra ataques cibernéticos.

O cenário atual das subestações quanto à digitalização

Como o escopo da digitalização é entendido entre as concessionárias


Gestão de ativos
4
Ability
PMU e PDCs
Centro de controle
3
Super PDC PMUs
Oscilografia
SCADA Centro de controle
Plataforma Ellipse
Perímetro da sala de controle
1
6
WiFi Industrial
SCADA Nível 2
Redes de teleproteção com MPLS/TP
RTU Gateway Nível 2
Intelligent substation HMI
SDM600 Data manager
Operação
Station bus
Cyber segurança
2
5
Monitoramento dos equipamentos primários
Process bus
Merging units
Gerenciamento móvel da força de trabalho

Oportunidades para explorar com as Subestações Digitais

!

- Barramento de processo
- Cyber segurança
- Teleproteção com MPLS/TP
- Medidores sincrofasoriais PMU
- Gestão de ativos
- Comunicação WiFi por meio de redes MESH

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Aderência às normas

Além da redundância, sincronismo e performance …

Funcionalidades e recursos mencionados

IEC 61850-5

Communication networks and systems for power utility automation - Part 5: Communication requirements for functions and device models

IEC 61850-6

Communication networks and systems for power utility automation - Part 6: Configuration description language for communication in electrical substations related to IEDs

IEC 61850-8-1:

Communication networks and systems for power utility automation - Part 8-1: Specific communication service mapping (SCSM) - Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3

IEC 61850-9-2

Communication networks and systems for power utility automation - Part 9-2: Specific communication service mapping (SCSM) - Sampled values over ISO/IEC 8802-3

IEC/IEEE 61850-9-3

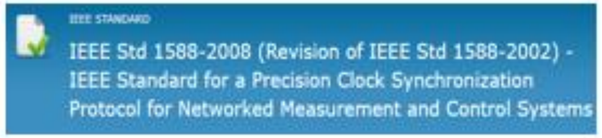
Communication networks and systems for power utility automation - Part 9-3: Precision time protocol profile for power utility automation

IEC 62439-3
Redline version

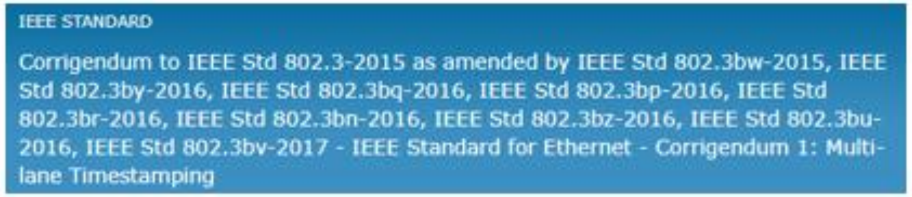
Industrial communication networks - High availability automation networks - Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR)

IEC 62351
Series

Power systems management and associated information exchange - Data and communications security - ALL PARTS


IEEE STANDARD

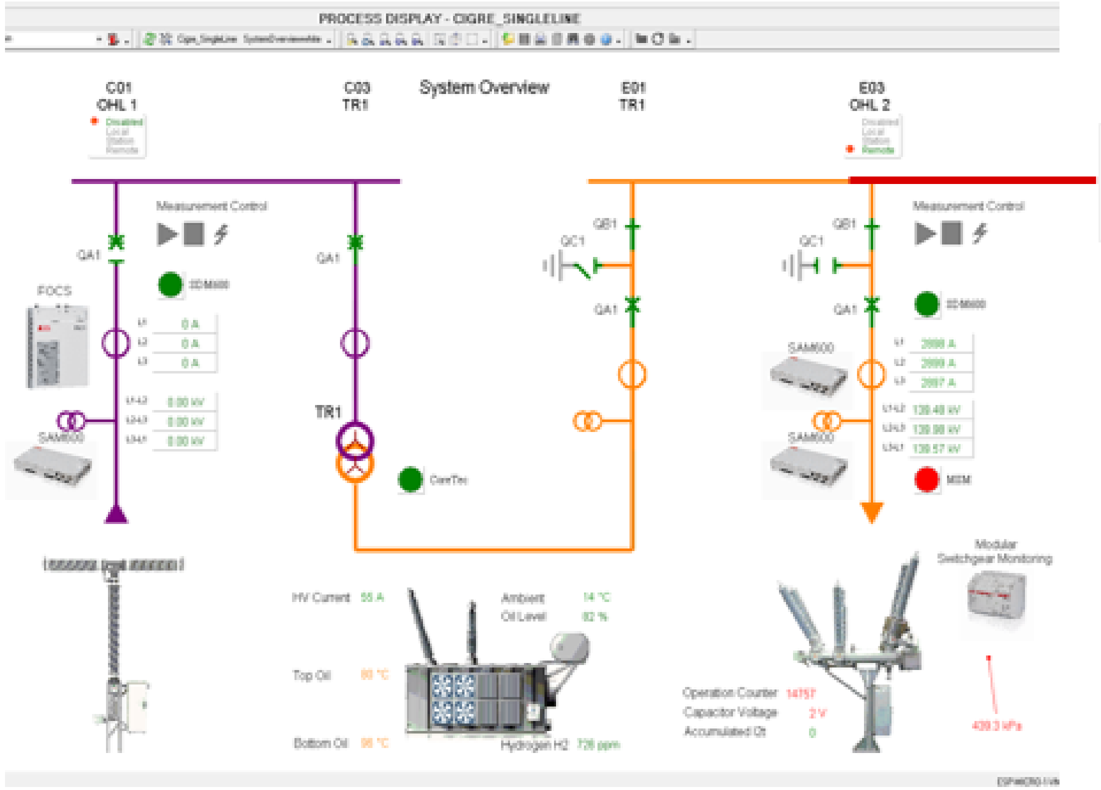
IEEE Std 1588-2008 (Revision of IEEE Std 1588-2002) - IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems


IEEE STANDARD

Corrigendum to IEEE Std 802.3-2015 as amended by IEEE Std 802.3bw-2015, IEEE Std 802.3by-2016, IEEE Std 802.3bq-2016, IEEE Std 802.3bp-2016, IEEE Std 802.3br-2016, IEEE Std 802.3bn-2016, IEEE Std 802.3bz-2016, IEEE Std 802.3bu-2016, IEEE Std 802.3bv-2017 - IEEE Standard for Ethernet - Corrigendum 1: Multi-lane Timestamping

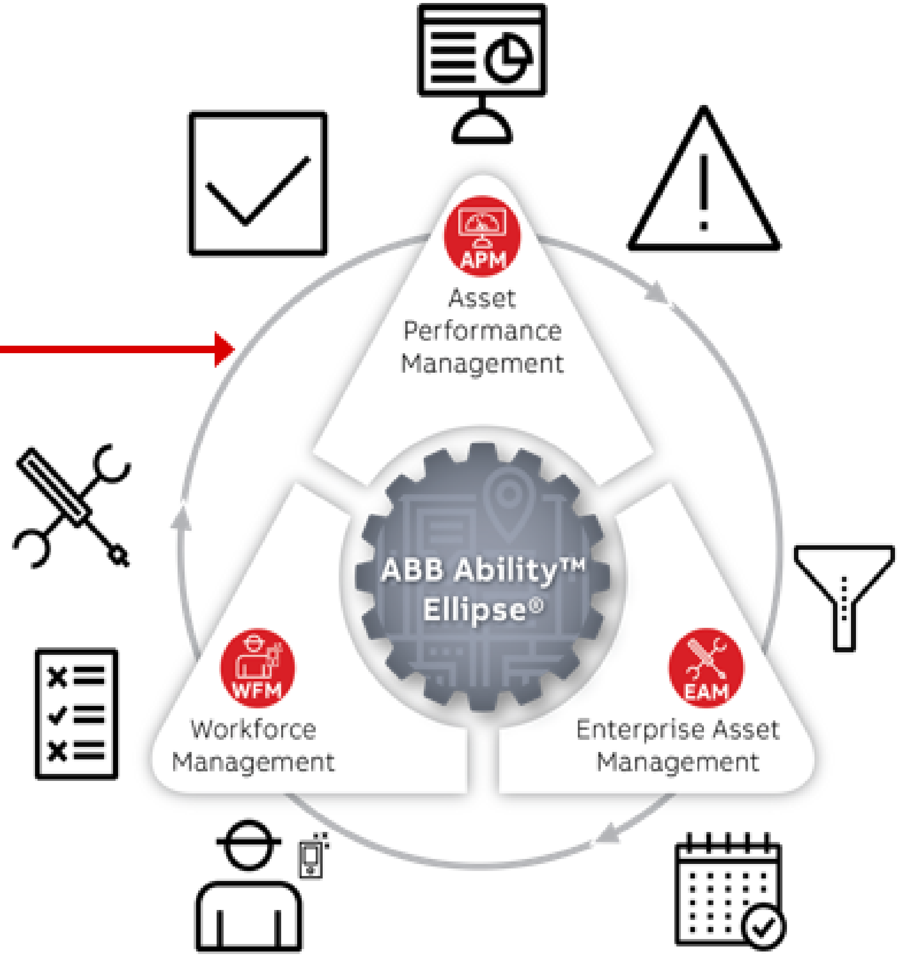
Gestão de ativos na era da subestação digital

Plataforma ABB Ability Ellipse


PROCESS DISPLAY - CIGRE_SINGLELINE
C01
OHL 1
Disabled
Local
Station
Remote
C03
TR1
System Overview
E01
TR1
E03
OHL 2
Measurement Control
QA1
QB1
QC1
FOCS
SAM600
TR1
L1 0 A
L2 0 A
L3 0 A
0.00 kV
0.00 kV
0.00 kV
2998 A
2999 A
2997 A
139.48 kV
139.98 kV
139.57 kV
MSM
HV Current 55 A
Top Oil
Bottom Oil
Ambient 14 °C
Oil Level 82 %
Hydrogen H2 728 ppm
Operation Counter 14757
Capacitor Voltage 2 V
Accumulated Ot 0
Modular
Switchgear Monitoring

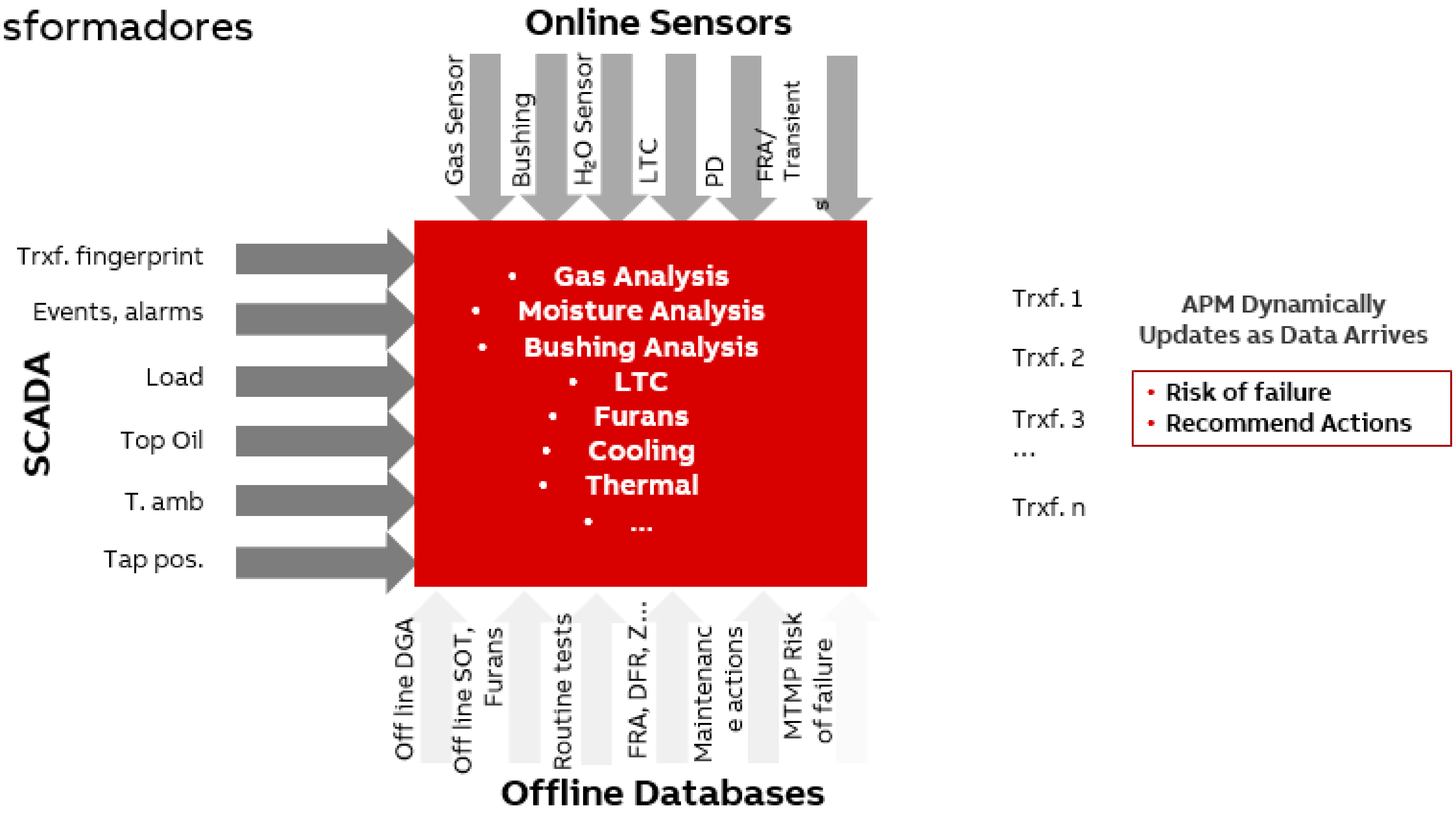
Historiador

Inspeções manuais


APM
Asset
Performance
Management
ABB Ability™
Ellipse®
WFM
Workforce
Management
EAM
Enterprise Asset
Management

Asset Performance Management

Modelo de transformadores



Online Sensors

Gas Sensor

Bushing

H_2O Sensor

LTC

PD

FRA/
Transient

s

SCADA

Trxf. fingerprint

Events, alarms

Load

Top Oil

T. amb

Tap pos.

- **Gas Analysis**
- **Moisture Analysis**
- **Bushing Analysis**
- **LTC**
- **Furans**
- **Cooling**
- **Thermal**
- **...**

Off line DGA

Off line SOT,
Furans

Routine tests

FRA, DFR, Z...

Maintenanc
e actions

MTMP Risk
of failure

Offline Databases

Trxf. 1

Trxf. 2

Trxf. 3

...

Trxf. n

**APM Dynamically
Updates as Data Arrives**

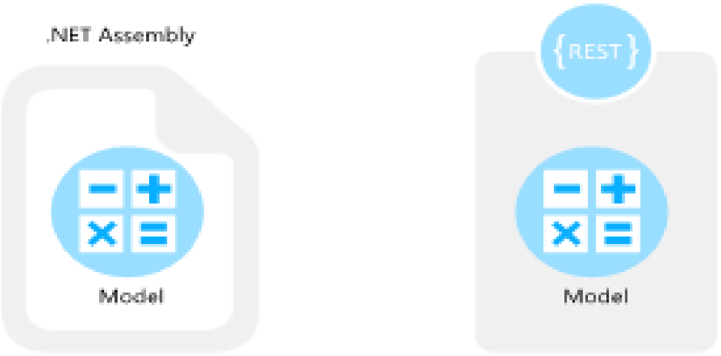
- **Risk of failure**
- **Recommend Actions**

Asset Performance Management

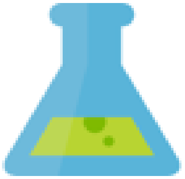
Modelos

1. Transformadores e reatores
2. Disjuntores
3. Baterias de subestação
4. Linhas de transmissão
5. Banco de capacitores
6. TC e TP
7. Cabos subterrâneos
8. Modelos em desenvolvimento:
   - relé, religadores, turbinas eólicas

9. Open Model Interface



10. Machine Learning



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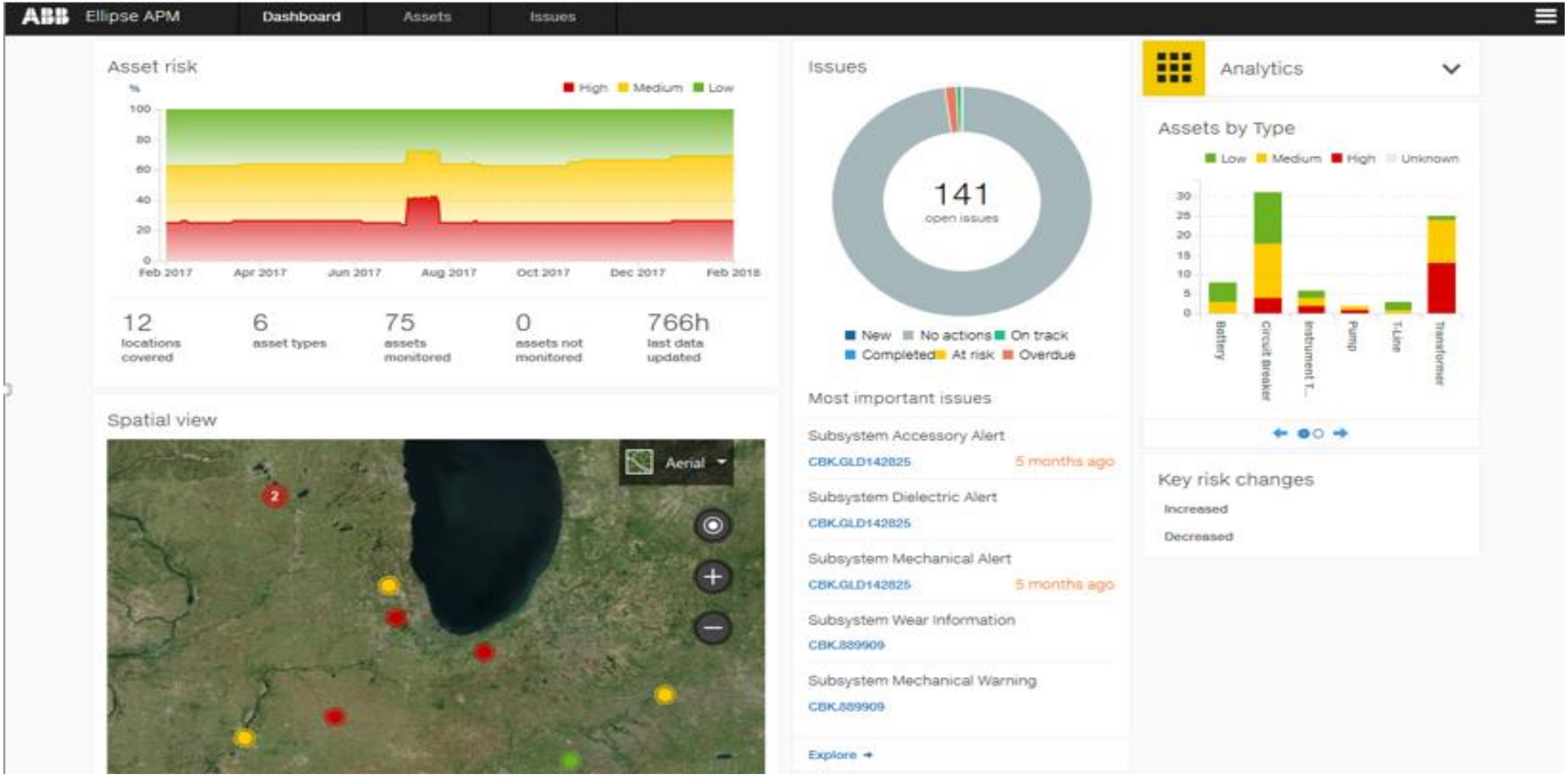
ABB Ellipse APM
Dashboard
Assets
Issues
%
High
Medium
Low
100
80
60
40
20
0
Feb 2017
Apr 2017
Jun 2017
Aug 2017
Oct 2017
Dec 2017
Feb 2018
New
No actions
On track
Completed
At risk
Overdue
Analytics
Low
Medium
High
Unknown
30
25
20
15
10
5
0
Battery
Circuit Breaker
Instrument T...
Pump
T-Line
Transformer
Aerial

Asset risk

12 locations covered

6 asset types

75 assets monitored

0 assets not monitored

766h last data updated

Issues

141 open issues

Most important issues

Subsystem Accessory Alert
CBK.GLD142825 5 months ago

Subsystem Dielectric Alert
CBK.GLD142825

Subsystem Mechanical Alert
CBK.GLD142825 5 months ago

Subsystem Wear Information
CBK.889909

Subsystem Mechanical Warning
CBK.889909

Explore →

Spatial view

Assets by Type

Key risk changes

Increased

Decreased

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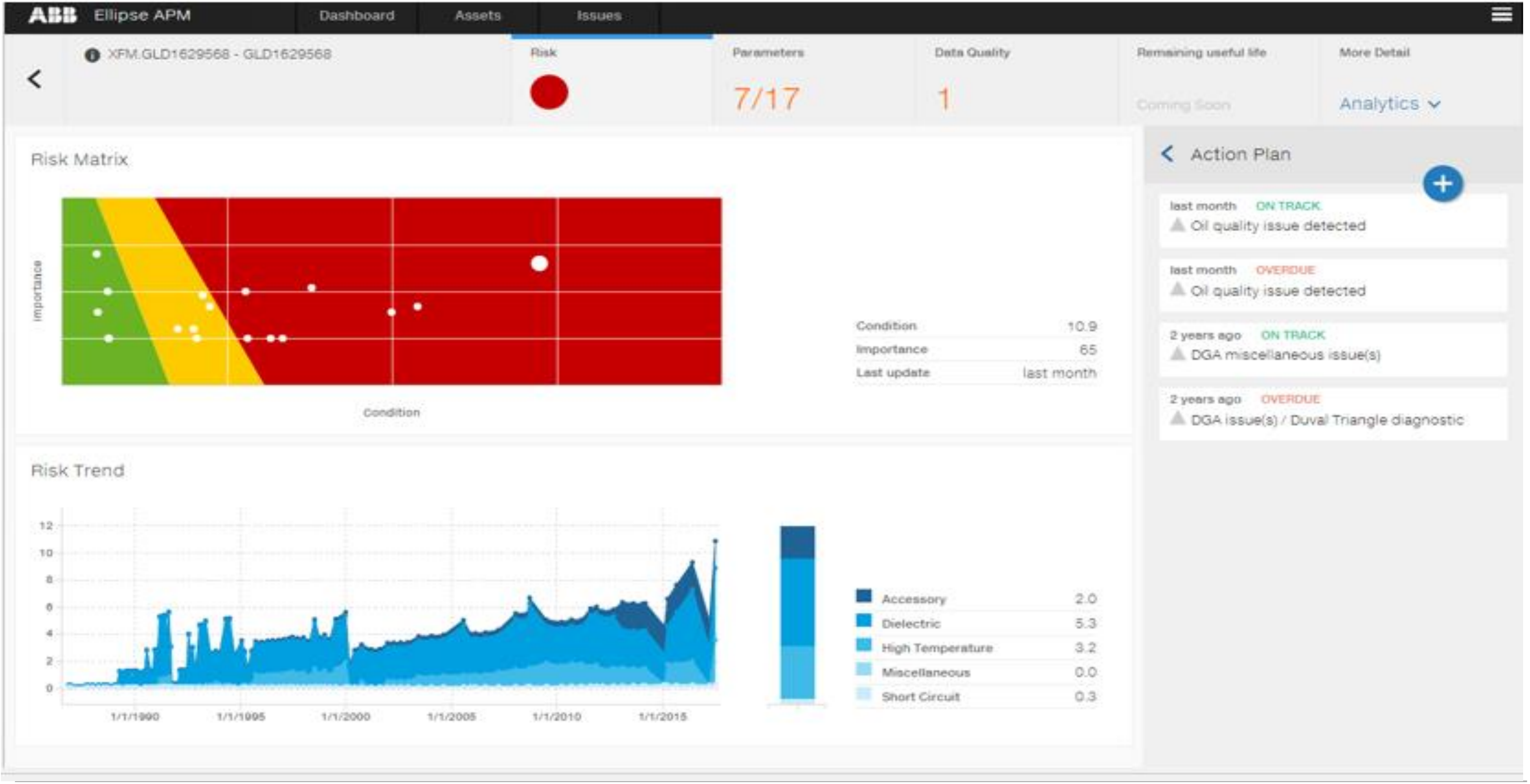


ABB Ellipse APM
Dashboard
Assets
Issues
Risk
Parameters
Data Quality
Remaining useful life
More Detail
Analytics
Risk Matrix
importance
Condition
Risk Trend
12
10
8
6
4
2
0
1/1/1990
1/1/1995
1/1/2000
1/1/2005
1/1/2010
1/1/2015

XFM.GLD1629568 - GLD1629568

Parameters: 7/17

Data Quality: 1

Remaining useful life: Coming Soon

Condition	10.9
Importance	65
Last update	last month

Accessory	2.0
Dielectric	5.3
High Temperature	3.2
Miscellaneous	0.0
Short Circuit	0.3

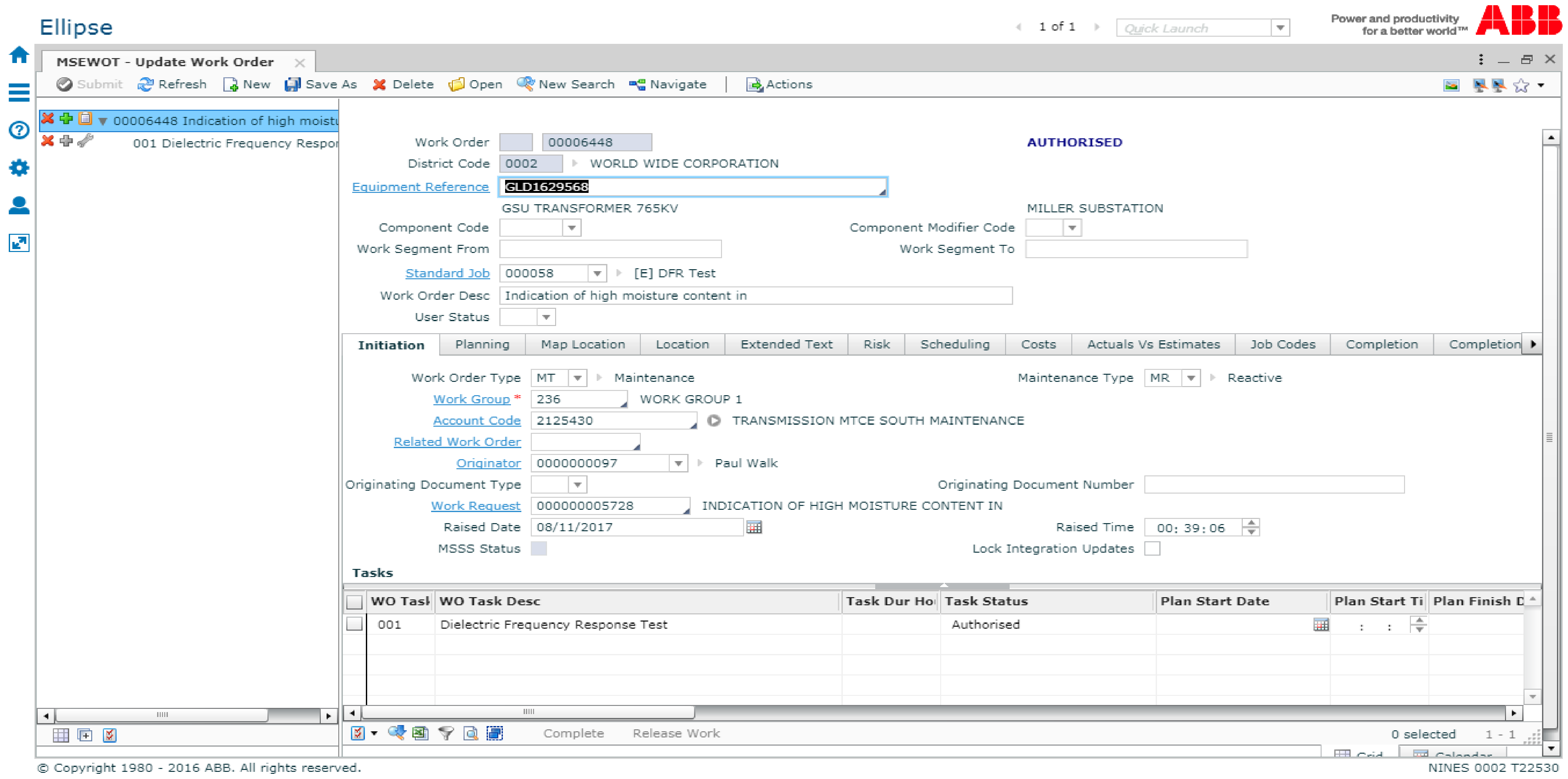
Action Plan

last month ON TRACK
Oil quality issue detected

last month OVERDUE
Oil quality issue detected

2 years ago ON TRACK
DGA miscellaneous issue(s)

2 years ago OVERDUE
DGA issue(s) / Duval Triangle diagnostic


Ellipse
1 of 1
Quick Launch
Power and productivity for a better world™
MSEWOT - Update Work Order
Submit
Refresh
New
Save As
Delete
Open
New Search
Navigate
Actions
00006448 Indication of high moistu
001 Dielectric Frequency Respo
Initiation
Planning
Map Location
Location
Extended Text
Risk
Scheduling
Costs
Actuals Vs Estimates
Job Codes
Completion
Completion
Complete
Release Work
0 selected
1 - 1
Grid
Calendar

Work Order 00006448 AUTHORISED
District Code 0002 WORLD WIDE CORPORATION
Equipment Reference GLD1629568
GSU TRANSFORMER 765KV MILLER SUBSTATION
Component Code
Component Modifier Code
Work Segment From
Work Segment To
Standard Job 000058 [E] DFR Test
Work Order Desc Indication of high moisture content in
User Status

Work Order Type MT Maintenance
Maintenance Type MR Reactive
Work Group * 236 WORK GROUP 1
Account Code 2125430 TRANSMISSION MTCE SOUTH MAINTENANCE
Related Work Order
Originator 0000000097 Paul Walk
Originating Document Type
Originating Document Number
Work Request 000000005728 INDICATION OF HIGH MOISTURE CONTENT IN
Raised Date 08/11/2017
Raised Time 00: 39: 06
MSSS Status
Lock Integration Updates ☐

Tasks

☐	WO Tasl	WO Task Desc	Task Dur Ho	Task Status	Plan Start Date	Plan Start Ti	Plan Finish D
☐	001	Dielectric Frequency Response Test		Authorised		: :	

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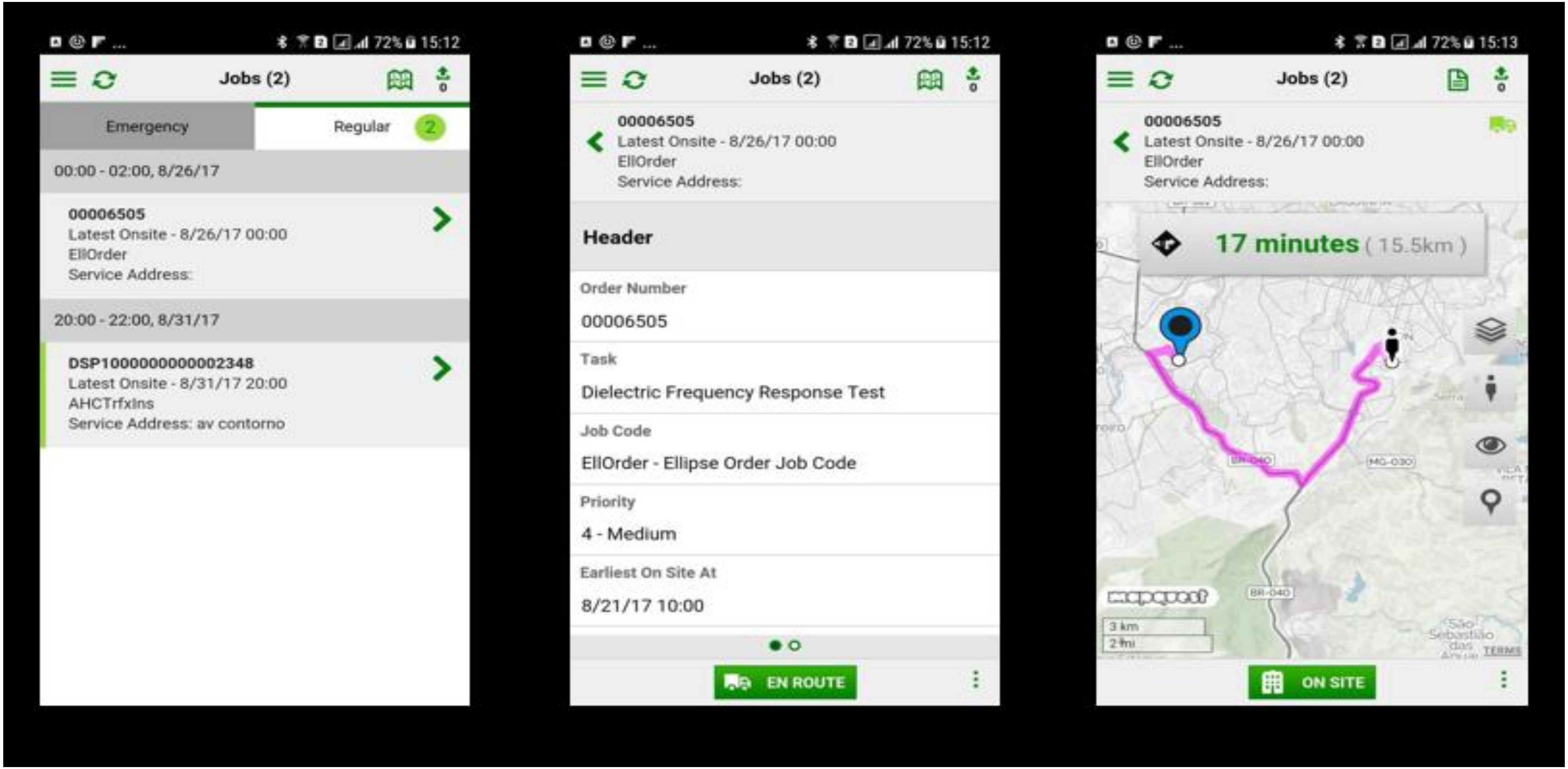
NINES 0002 T22530



Jobs (2)

Emergency | Regular 2

00:00 - 02:00, 8/26/17

00006505
Latest Onsite - 8/26/17 00:00
EllOrder
Service Address:

20:00 - 22:00, 8/31/17

DSP1000000000002348
Latest Onsite - 8/31/17 20:00
AHCTrfxIns
Service Address: av contorno

Jobs (2)

00006505
Latest Onsite - 8/26/17 00:00
EllOrder
Service Address:

Header

Order Number
00006505

Task
Dielectric Frequency Response Test

Job Code
EllOrder - Ellipse Order Job Code

Priority
4 - Medium

Earliest On Site At
8/21/17 10:00

Jobs (2)

00006505
Latest Onsite - 8/26/17 00:00
EllOrder
Service Address:

72% 15:12
72% 15:12
72% 15:13
EN ROUTE
17 minutes (15.5km)
BR-040
MG-030
mapquest
3 km
2 mi
São Sebastião das Águas
TERMS
ON SITE

Wearables

Apoio à manutenção

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Contatos

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