integrate.solve.**together.**

Grid Analytics

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Business challenge – Top of mind

Electricity distribution utilities have
limited visibility in the network,
difficulty to address these problems –

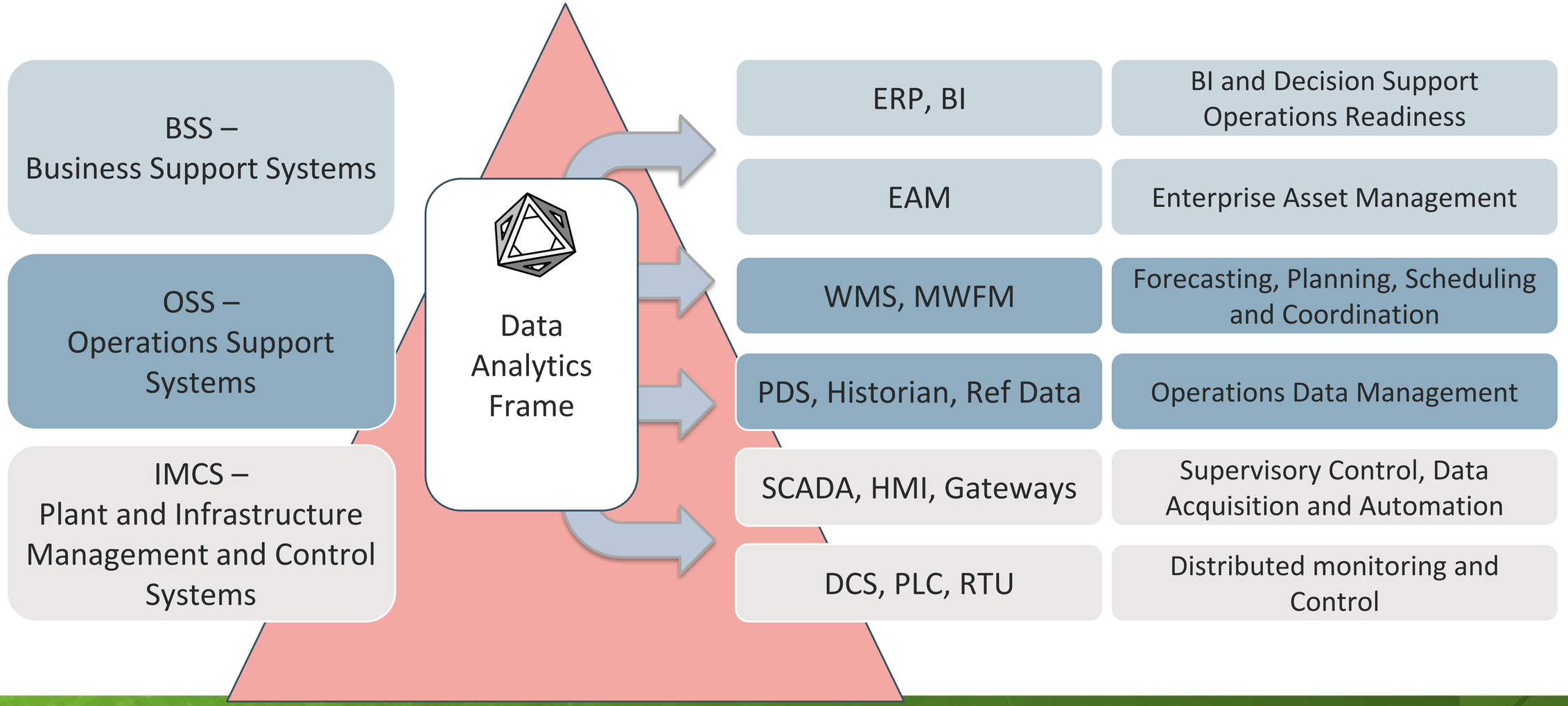
- High non-technical losses
- Preventing overloading network infrastructure
- Vandalism and theft of network infrastructure
- Expensive network operations
- Increasing failure rates in ageing infrastructure

IST's approach…

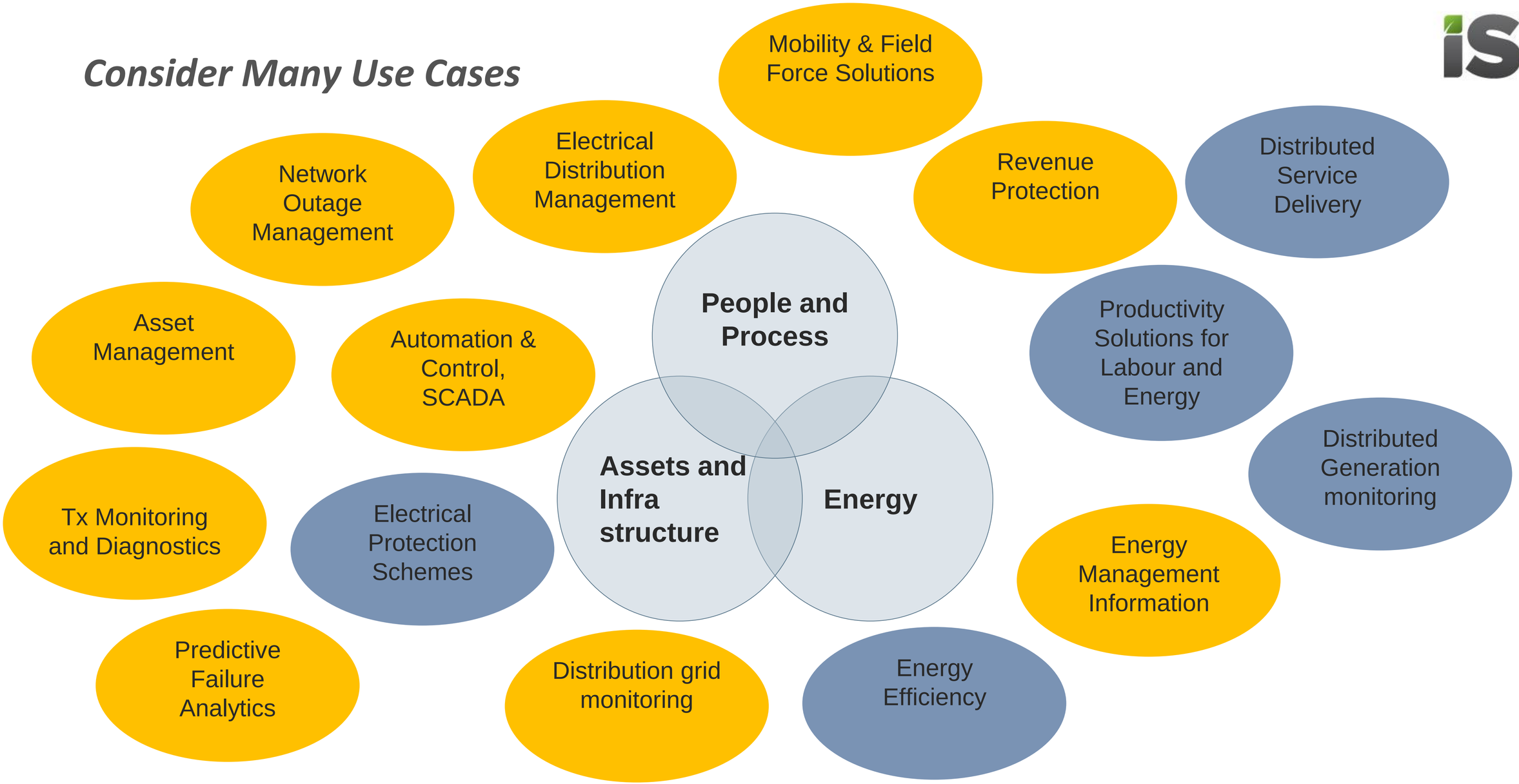
- flexible, to tailor, add, change functionality
- low cost
- get deeper and wider visibility in distribution grid

- Apply IoT technology at a lower cost than before
- Apply cloud based and proven open source technologies
- Leverage existing systems and data

Interact with all Business and Operations Layers



Consider Many Use Cases



Scalable analytics infrastructure

AQUEDUCT

IST partners with EOH Big Data Lab to deliver scalable and Intelligent solutions for industry

Aqueduct is a big data analytics solution framework developed by EOH Big Data Lab

Aqueduct utilises best of kind open technologies within a scalable platform that is independent of computing infrastructure

Ingestion of data from external systems
- Data collection
- Geo temporal coding
- Nodal/modal coding

AQUIFER

Storage of data
- Streaming and batch data (Kafka)
- Data consolidation
- Geo temporal & Nodal/Model Indexing
- Data storage (Cassandra)

CASTELLUM

Processing of data
- Rule sets and event driven processing
- Predictive analytics
- Notification, files and event streams output

EDUCTOR

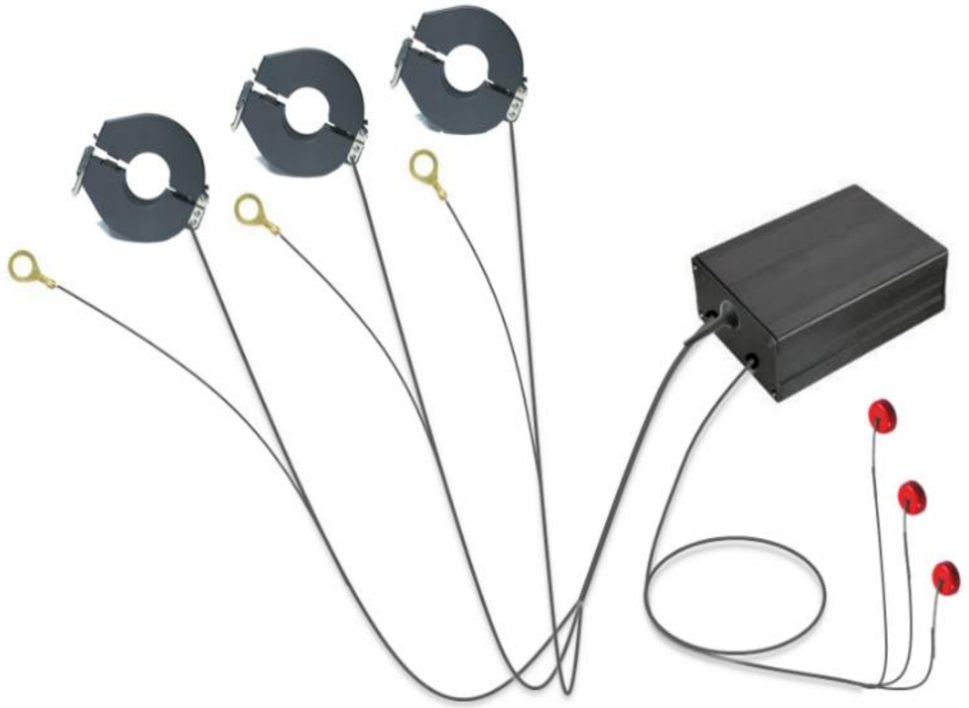
Collaboration
- Data science notebooks (Zeppelin)
- Machine learning and scalable processing (Spark)
- Dashboards and reports (Kibana)

FONTANA

New grid monitors

IST conceptualised, specified units to assist in the implementation of these use cases

South African developed and manufactured units, integrated with local developed Cloud Analytics Platform



Units offer:

- Low cost alternative
- Easy fitting and installation
- IP65 closure and CTs
- 3 phase Energy Meter - Class 0.5, 4 Qdr
- GRPS - SMS, DNP3 and MQTT
- Vibration and GPS location
- 4x temperature

Use cases for our value proposition

Revenue assurance

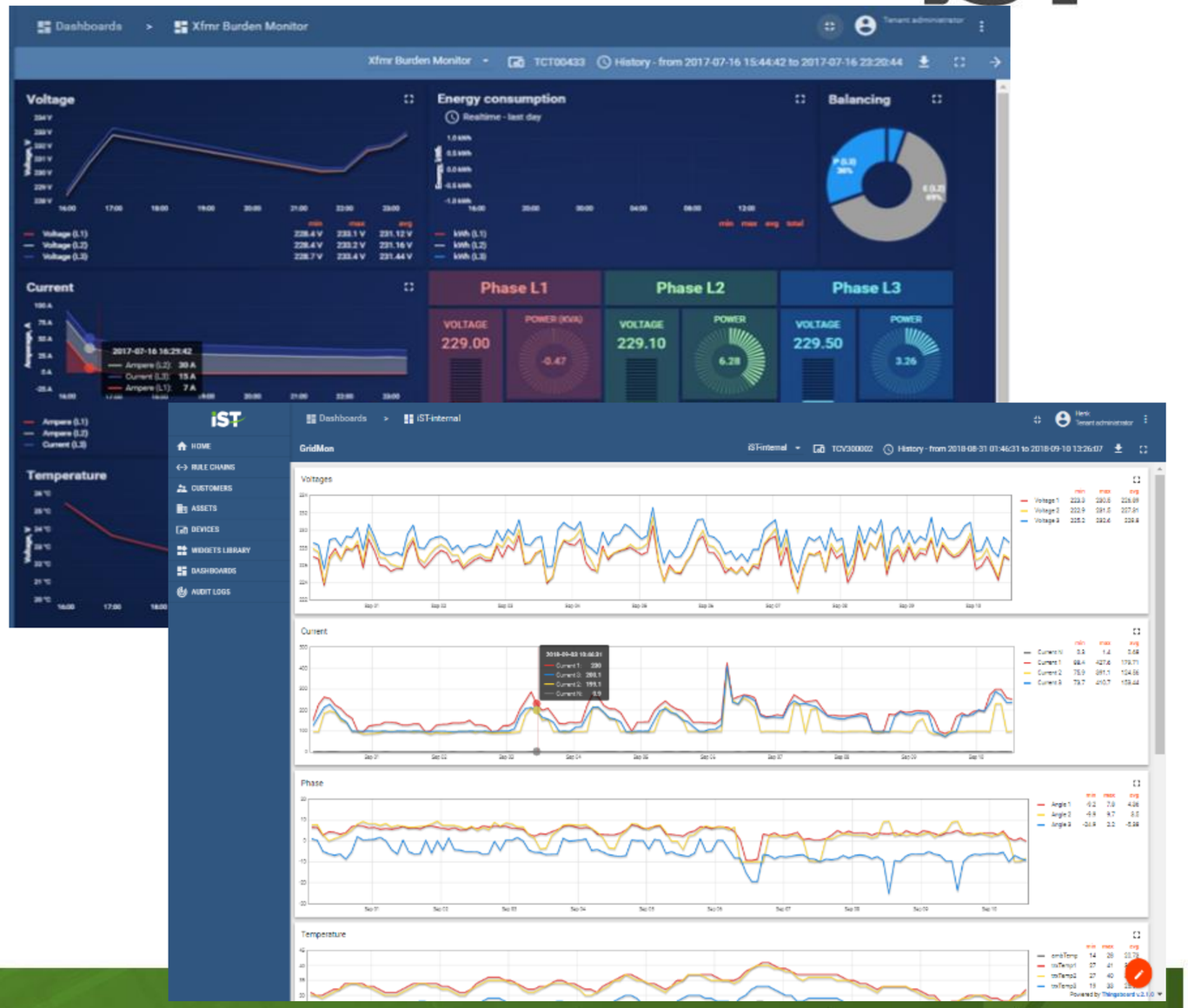
- Energy balancing, profiling and notifications to the field
- Real-time tariff analysis and profitability tracking for utilities

Asset Management

- Cloud based algorithms to monitor and assess transformer condition
- Monitor operating conditions and unit performance for OEMs and utilities
- Detect and respond to tampering and vandalism

Grid operations

- Improve outage management
- Improve regulatory reporting QoS



Key objectives and findings so far

1. Cloud platform for monitoring and analytics

2. Busy with trials and embarking on discovery journeys with customers

3. Extend the functional capabilities in conjunction with the customer needs by deploying Functions as a Service

4. Develop the roadmap of additional Functions as Service on a wider range of data sources and feeds from the customer operations

5. Prepare a platform that is able to scale and support national (international) deployment at any municipality/metro

ThingsBoard | Dashboard

https://www.ist-digital.info/dashboards/89e31550-2fa9-11e9-81b9-0f66ea75718a

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HOME
RULE CHAINS
CUSTOMERS
ASSETS
DEVICES
ENTITY VIEWS
WIDGETS LIBRARY
DASHBOARDS
AUDIT LOGS

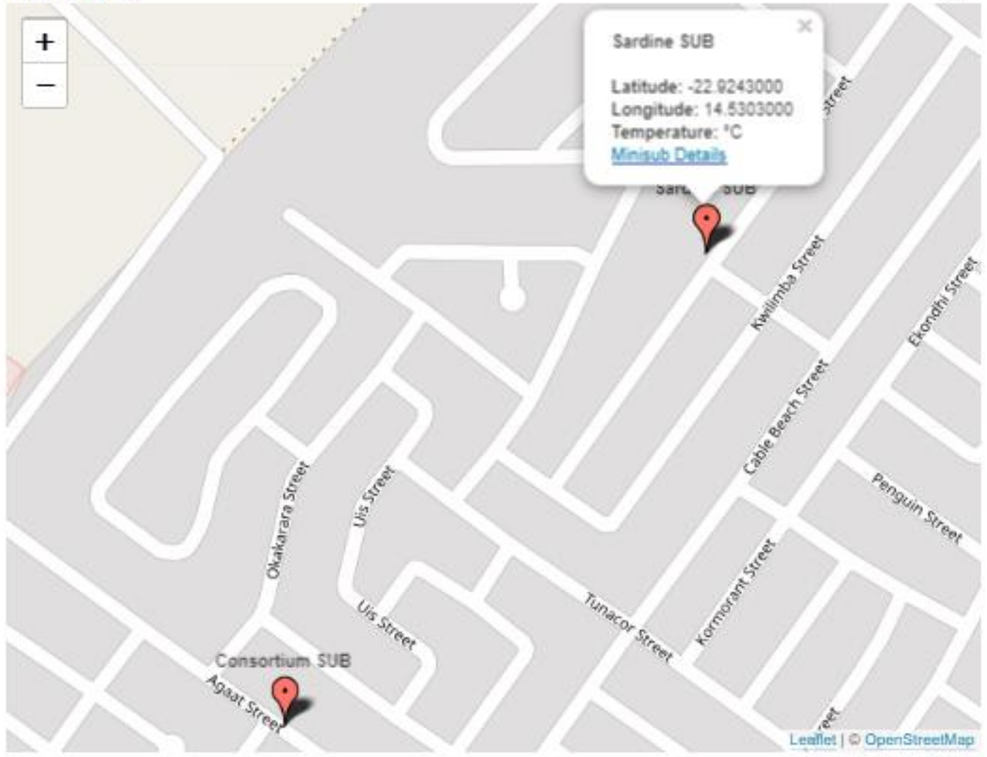
Dashboards > Grid View

Tenant administrator

Walvisbaai

Grid View | Entities | Realtime - last 30 days

District Map



Minisubs List

Entity name	Address
Consortium SUB	Walvisbaai
Sardine SUB	Walvisbaai

Page: 1 Rows per page: 10 1 - 2 of 2

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https://www.ist-digital.info/#

21:46

ThingsBoard | Dashboard

https://www.ist-digital.info/dashboards/89e31550-2fa9-11e9-81b9-0f66ea75718a?state=W3siaWQiOiJkZWZhdWx0IiwicGFyYW1zIjp7fX0seyJ...

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HOME
RULE CHAINS
CUSTOMERS
ASSETS
DEVICES
ENTITY VIEWS
WIDGETS LIBRARY
DASHBOARDS
AUDIT LOGS

Dashboards > Grid View

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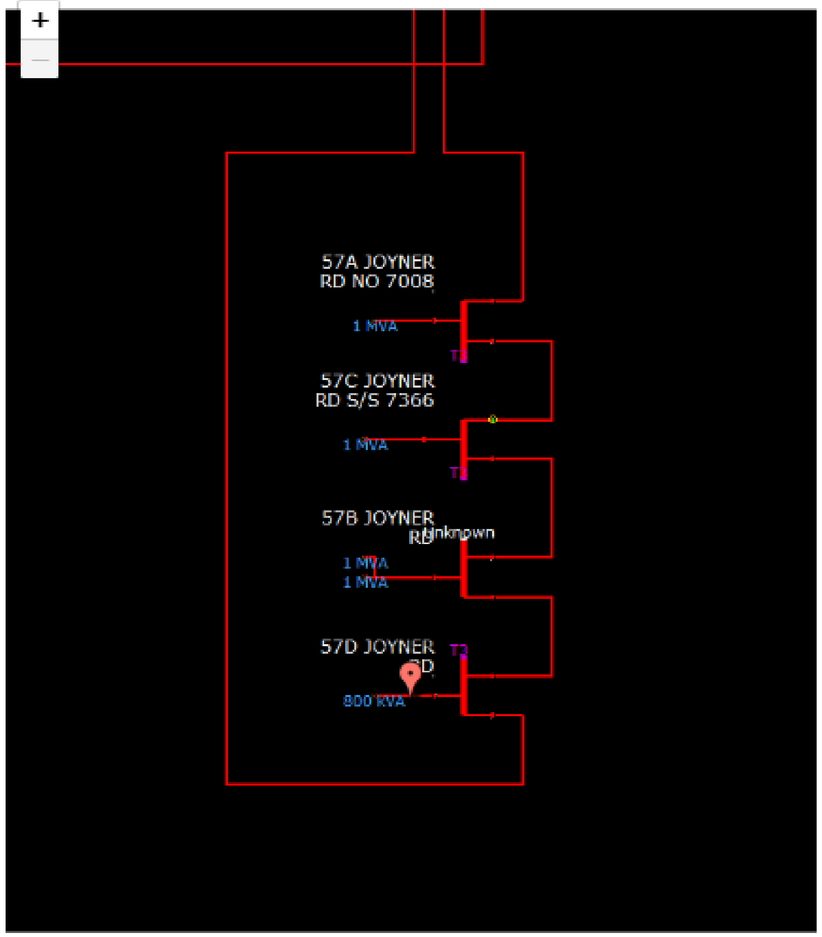
Grid View | Entities | Realtime - last 30 days

Feeder Schematic



Latest Readings

ecwin_channel002

voltage1
voltage2
voltage3
current1
current2
current3
angle1
angle2
angle3
TransformerVoltRating

ecwin_channel003

voltage1
voltage2
voltage3
current1

Latest Loading

ecwin_channel002

kVALoading_calc
kVA1
kVA2
kVA3
kVArLoading_calc
kVAr1
kVAr2
kVAr3
kWLoading_calc
kW1
kW2
kW3
TransformerkVARating

ecwin_channel003

kVALoading_calc

Latest Temperatures

ecwin_channel002

Top Oil
Centre Oil
Bottom Oil
Ambient

ecwin_channel003

Latest Energy Readings

ecwin_channel002

kWh
kVArh
kVAh

ecwin_channel003

Latest Reading Times

ecwin_channel002

digInput1	ON
digInput2	ON
gsmRSSI	
gpsSatelites	
gpsLock	
lastConnectTime	Thu Feb 14 2019 21:20:21 GMT+0200 (South Africa Standard Time)
lastActivityTime	Thu Feb 14 2019 21:20:21 GMT+0200 (South Africa Standard Time)
inactivityAlarmTime	Thu Feb 14 2019 21:20:21 GMT+0200 (South Africa Standard Time)
active	ACTIVE

ecwin_channel003

digInput1	ON

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21:21

ThingsBoard | Dashboard

https://www.ist-digital.info/dashboards/89e31550-2fa9-11e9-81b9-0f66ea75718a?state=W3siaWQiOiJkZWZhdWx0IiwicGFyYW1zIjp7fX0seyJ...

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Dashboards > Grid View

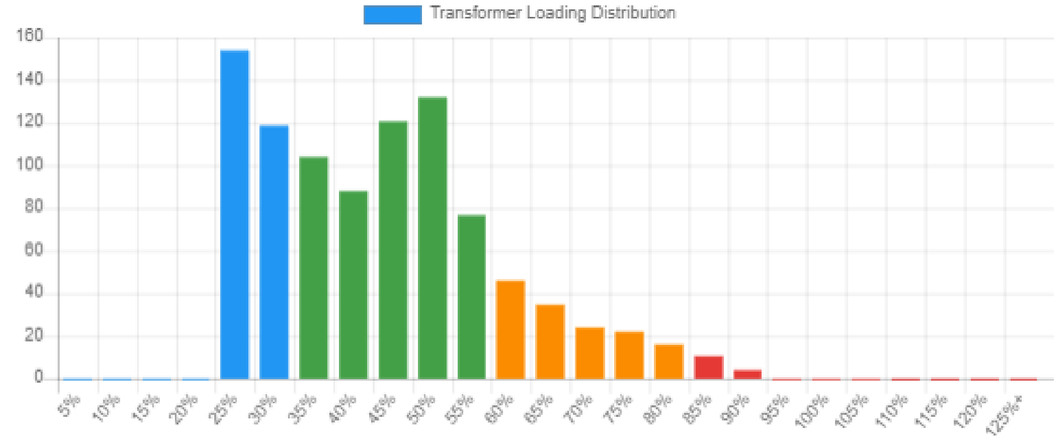
Tenant administrator

HOME
RULE CHAINS
CUSTOMERS
ASSETS
DEVICES
ENTITY VIEWS
WIDGETS LIBRARY
DASHBOARDS
AUDIT LOGS

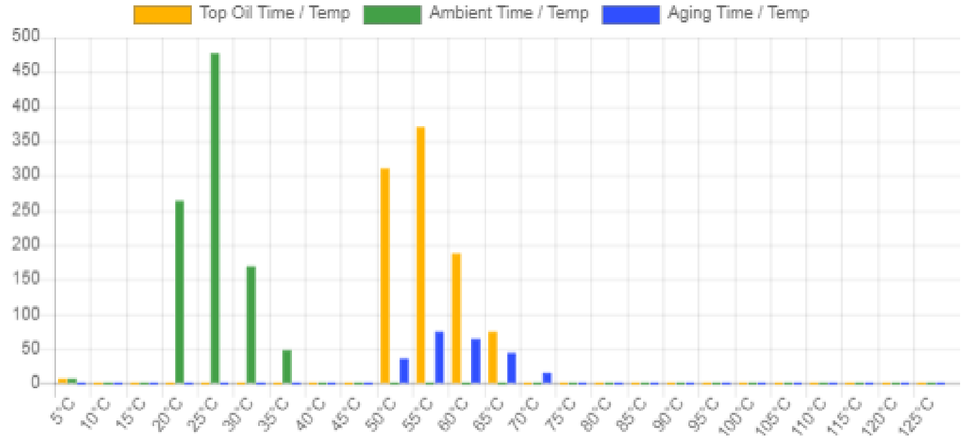
Walvisbaai > Consortium SUB > **ecwin_channel002**

Grid View | TCV300002 | History - from 2019-01-15 21:22:15 to 2019-01-23 19:21:12

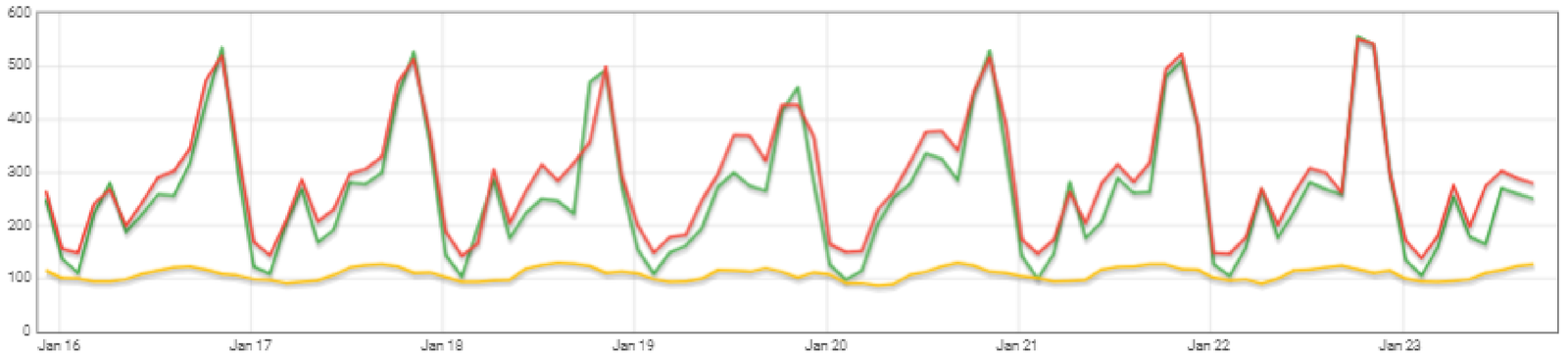
Transformer Loading Distribution



Transformer Temperature Distributions



Power



	min	max	avg
Real power (kW)	99	556.1	261.35
Apparent power (kVA)	140	551.2	288.58
Reactive power (kVAr)	88	131	110.02

Power factor angle

50 °

min

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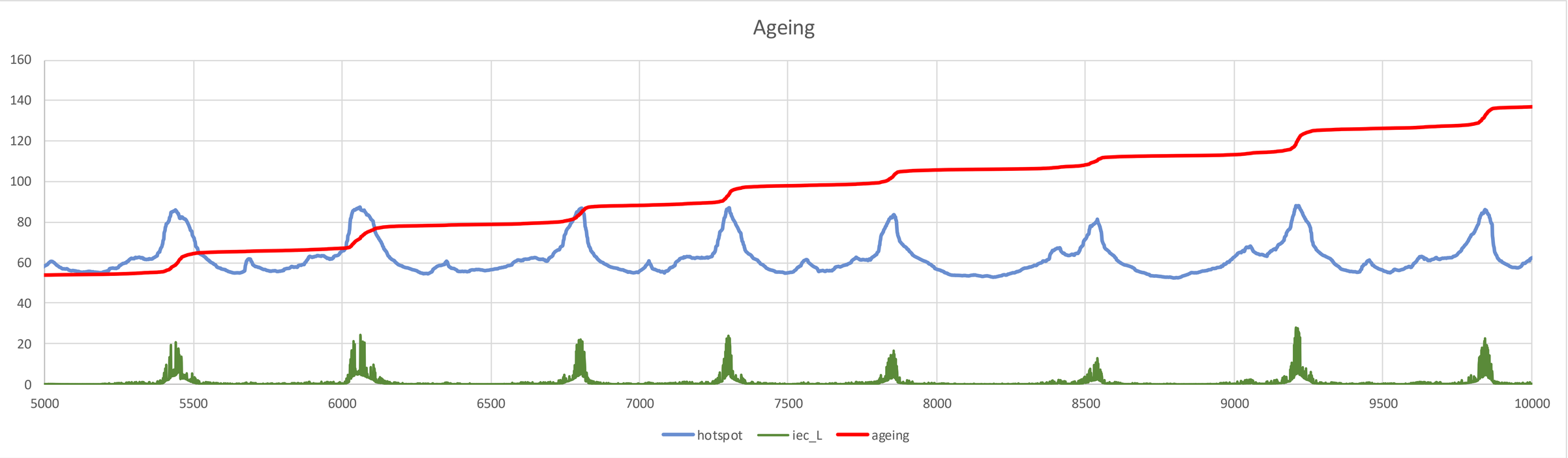
21:24

Asset Utilisation and Ageing

Assessment of transformer loading and ageing



Calculating the **ageing** based on application of IEC60076-7
Indicative lifespan

ThingsBoard | Dashboard

https://www.ist-digital.info/dashboards/89e31550-2fa9-11e9-81b9-0f66ea75718a?state=W3siaWQiOiJkZWZhdWx0IiwicGFyYW1zIjp7fX0seyJ...

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HOME
RULE CHAINS
CUSTOMERS
ASSETS
DEVICES
ENTITY VIEWS
WIDGETS LIBRARY
DASHBOARDS
AUDIT LOGS

Dashboards > Grid View

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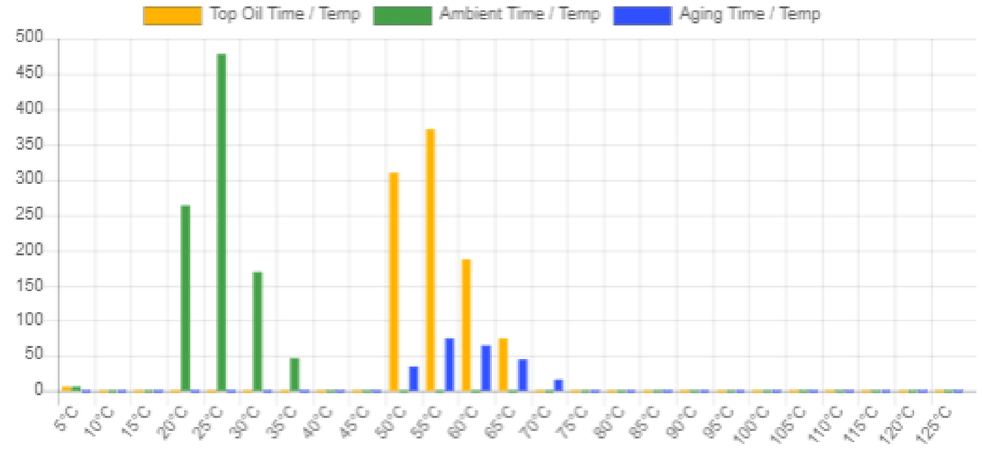
Walvisbaai > Consortium SUB > ecwin_channel002

Grid View | TCV300002 | History - from 2019-01-15 21:22:15 to 2019-01-23 19:21:12

Transformer Temperature Distributions



Aging
238 hours

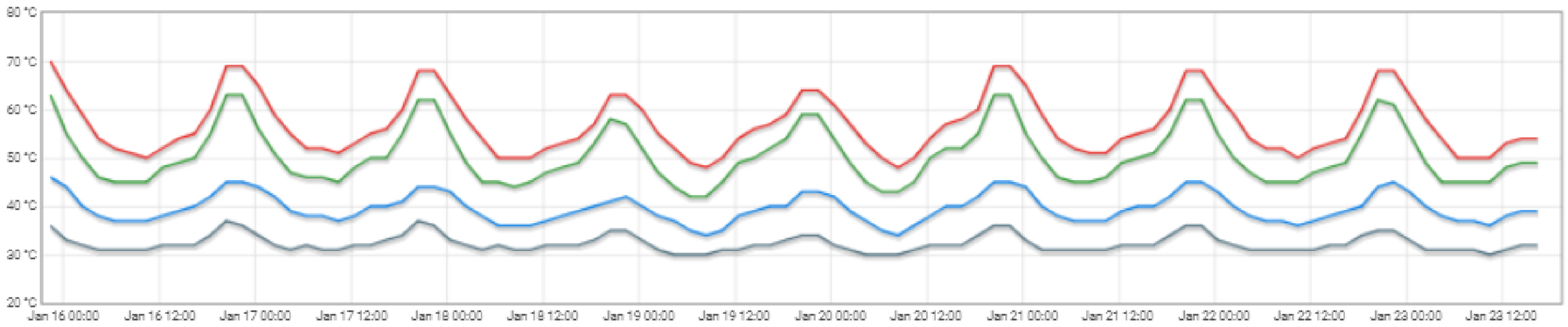
Aging
9.9 days

Aging KPI
24.6 %

Run time
968 hours

Run time
40.3 days

Temperature



	min	max	avg
Top Oil	48 °C	70 °C	57 °C
Centre Oil	42 °C	63 °C	51 °C
Bottom Oil	34 °C	46 °C	40 °C
Ambient	30 °C	37 °C	32 °C

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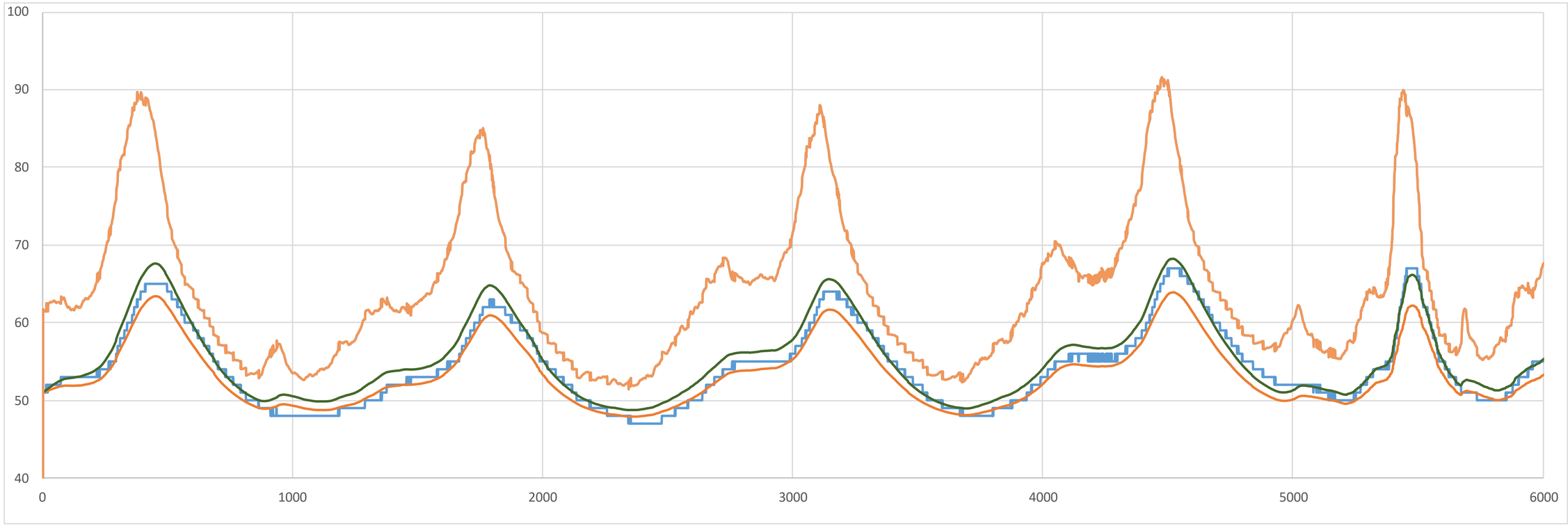
21:22

Asset status

Assessment of transformer loading temperature



- Adjusted effective **rating / de-rating** of the transformer (IEC60076-7)
- Notifications of over temperature for over-loading
- Notifications of vibration for tampering

https://www.ist-digital.info/dashboards/f54fa3e0-44d9-11e9-839a-67a1b4f98856

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- CUSTOMERS
- ASSETS
- DEVICES
- ENTITY VIEWS
- WIDGETS LIBRARY
- DASHBOARDS
- AUDIT LOGS

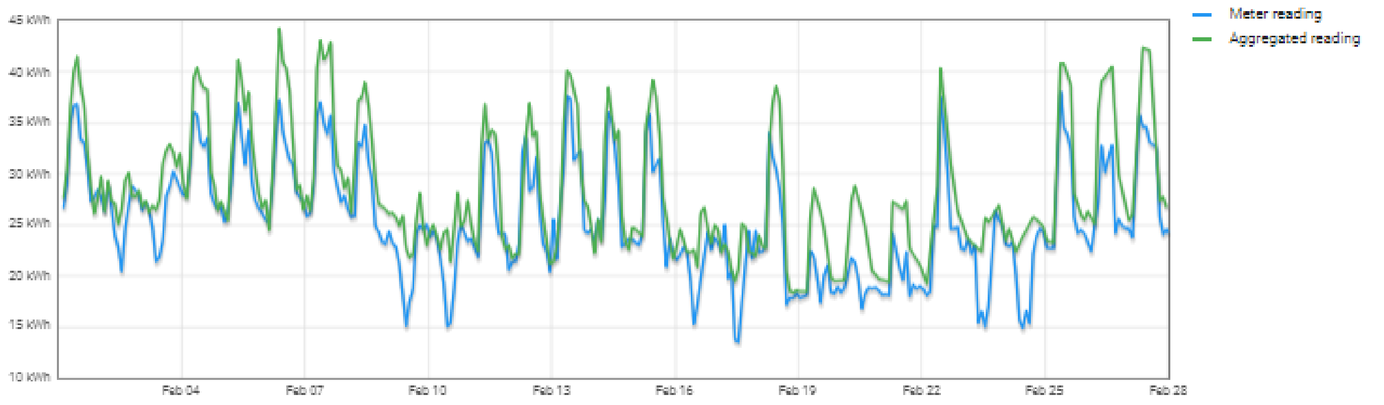
Dashboards > Energy balance IST

Tenant administrator

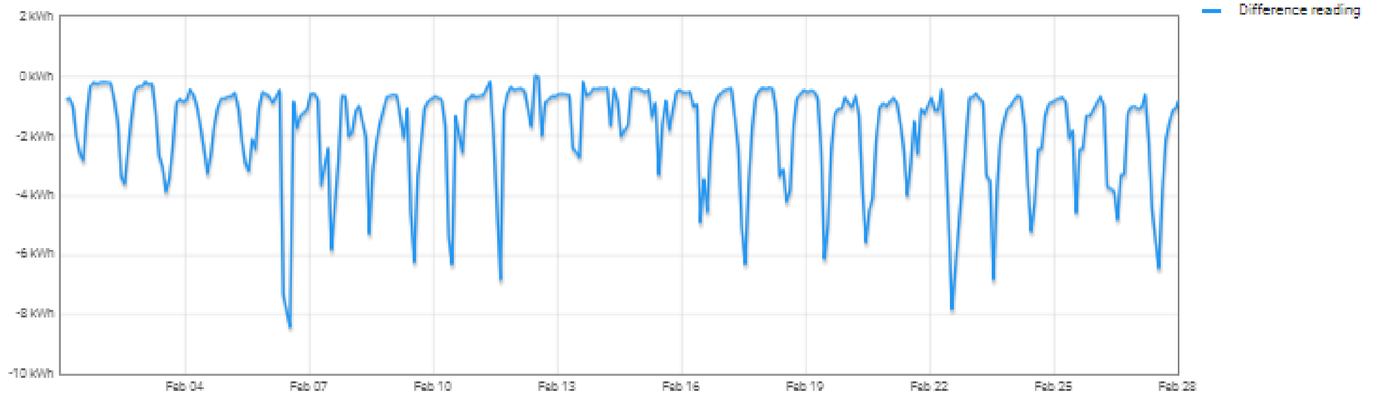
Energy balance IST

Energy balance IST | ecwin_bal_ist | History - from 2019-02-01 00:00:00 to 2019-02-28 00:01:00

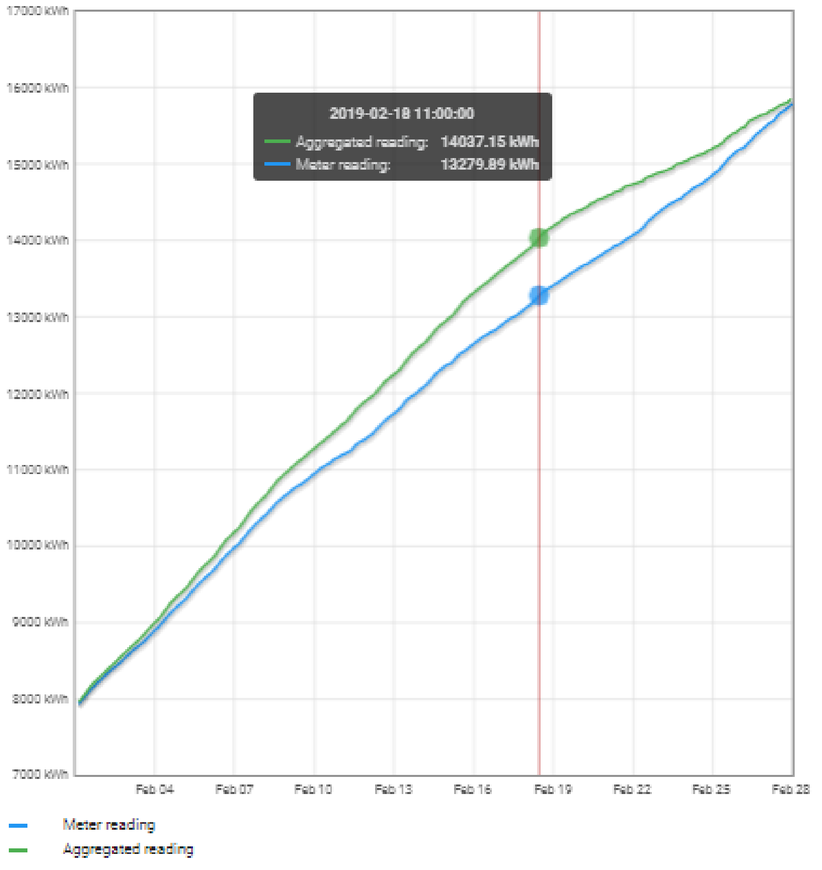
Energy balancing



Difference energy reading



Cumulative energy



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THANK YOU

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