



THE 20TH INTERNATIONAL OPERATIONS & MAINTENANCE
CONFERENCE IN THE ARAB COUNTRIES



Drones' and AI Inspection

For Overhead lines power network Stability and
Reliability in National Grid SA

An Initiative by

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20 YEARS



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National Grid SA

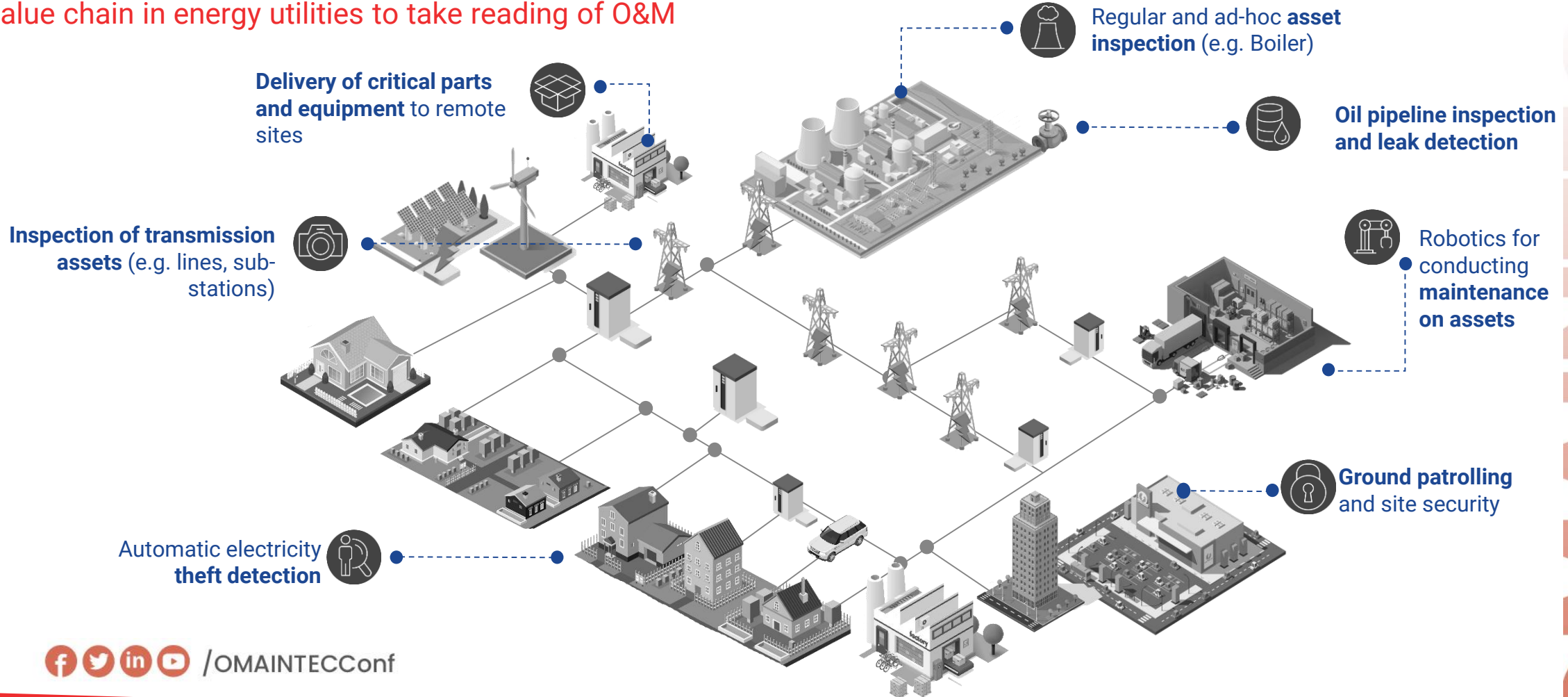
Drones are Smart Technologies utilized to be controlled for Harvesting Data



If big data is the “new raw oil”,

Sensors technology systems, to get reading from monitoring systems, using drones & robotics as “the new raw oil refineries” that “fuel” the AI models development

Drones with Sensors technology systems can be deployed across the value chain in energy utilities to take reading of O&M



The Problem



big OHL's network around 92000 Circular km across large geographical area



High risk on human with OHL Climbing



long-live assets needed to maintained over a long time period



Hard Tower's road accessibility & High Cost of maintenance with human and traditional methods

Solution & Impact



deploying drones for inspection of 4000 km overhead lines



Millions in savings for 4000 km inspection



enhancing System reliability and improving KPI's



Reducing Safety accidents to 0

Enhancement



integration of data & AI analyzation

3 key tangible benefits across safety, O&M costs, and asset availability-reliability → Optimization and Balance Energy Supply and Demand by enhancing:

| 2020 DATA

Safety Lower inspection incidents

Safety incidents 0
during drone inspection vs 7 incidents during manual inspection in 2019

Reduction in **corrective maintenance (CM) costs** as a result of better inspection and preventive maintenance

Cost Savings Reduced O&M costs

Inspection cost ~25-30%
reduction in costs between drone and manual inspection (2,275 vs. 3,150 SAR/km)

CM savings ~11%
in 2020 as a result of drone inspection

Revenue loss avoided ~3%
after drone inspection (~100 SAR/km of line)

Asset Availability/ Reliability Lower outages and improve reliability of power supply

SAIFI 30%
improvement after drone inspection

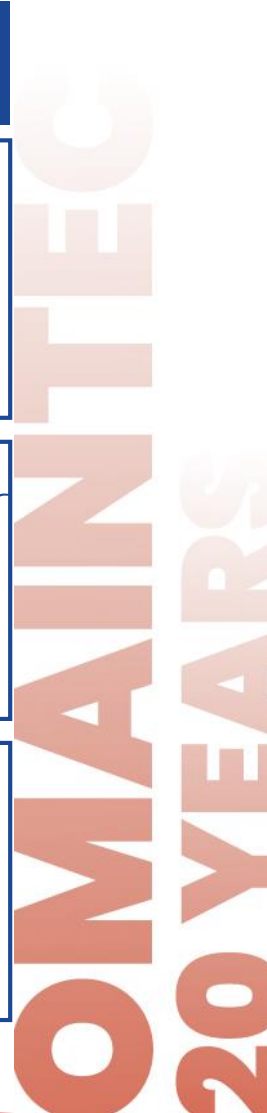
MAIFI 2%
improvement after drone inspection

DPs affected 34%
improvement (90 vs. 140 DPs annually/ 1K lines)

SAIDI 34%
improvement after drone inspection

ENS 34%
improvement after drone inspection

Inspection speed ~6-7X
increase in inspection speed vs current manual process



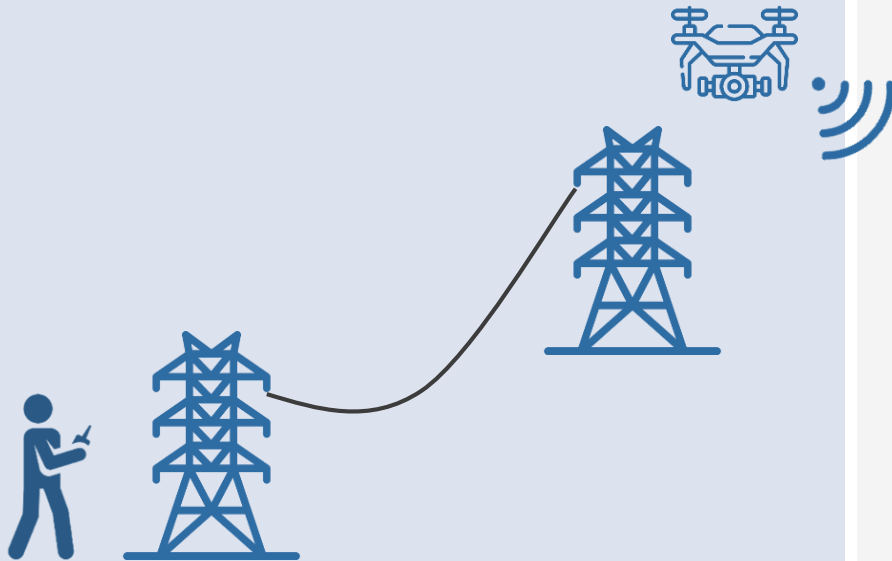
Main segments of analysis and AI Development

Drone operations (Data capture through drones)

AI software solution (Data analytics and reporting)

Sensors utilized

Drones are equipped with sensors based (e.g. visual, thermal, UV, LiDAR) on failure modes to be tested

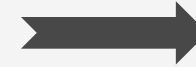
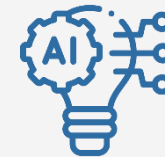
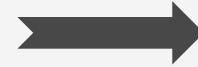


Drone flights

Drone operations provider/ National Grid SA pilots conduct flights using multi-rotor or fixed wing drones

Data management

Drones data is downloaded and uploaded to National Grid SA / SEC IT systems

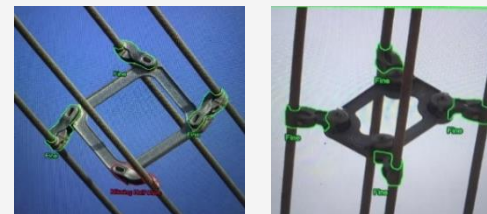


Preventive maintenance

Faults are reported to maintenance team for repair and recorded in ERP

AI image analytics

Software provider runs AI model customized for National Grid SA/ SEC to predict faults in asset images

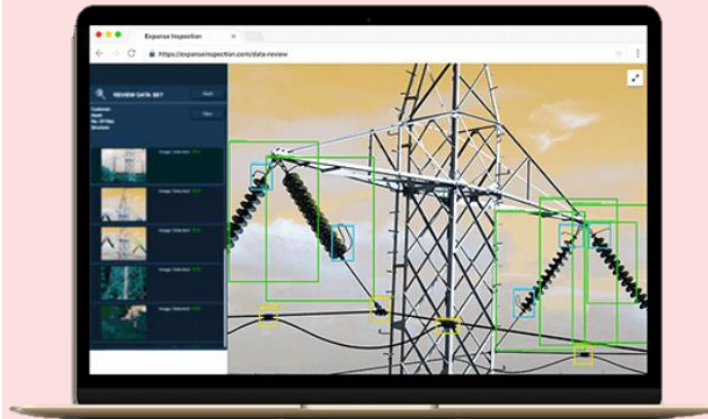


The AI Predictive analytics

Data acquisition and upload



AI predictive analytics by manufacturers



Reporting/ visualization

Integrated reporting/ visualization



Maintenance work order request SAP and phone apps



Benefits of AI solution



Rapid fault identification
(reduces image inspection time drastically for large datasets)



Multiple data streams
(integrate and analyze multiple data streams in a single platform)



Maintenance planning
(helps visualize maintenance requirements on a system level)



Asset health history
(links to supporting intelligent center that collect and integrate new health indecs)

SUMMARY

Problem & Solutions of Long-life assets inspections process

Improving Energy sector operation cost, reliability & satiability, safety with drones and AI analyzation and inspection instead of traditional elevated inspection to optimize operations among the value chain in NG SA internal operations

Targeted accomplishment & Benefits

It is planned to accomplish inspection of around 32,000 km of overhead lines to be done by drones and AI inspection methods by the end of 2025. the inspection of 4000 km and in the process of executing the rest to do optimization of cost specially with high cost equipment that need condition assessments. To reach improvement in SAIFI by 17%, SAIDI & ENS & DPs improvement 19%, and MAIFI 1%.

Holistic view

The actualization of Drones application into O&M with tailored solution for energy sector is different from Agriculture which will make the next generation ERP systems that integrate and utilize feeds of data from different tools help to create better health indices of the long life assets, do better analysis of operation to reach to predictive status readings of long life assets.

Inspired Recommendation

Development Big Data infrastructure and evaluation of enterprise resource planning (ERP) system to utilize AI into creating means of automation by software solutions (e.g. RPA) to develop within functions for any work of O&M is a must in the near future.



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