Drones’ and AI Inspection
For Overhead lines power network Stability and Reliability in National Grid SA
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

- Delivery of critical parts and equipment to remote sites
- Inspection of transmission assets (e.g. lines, substations)
- Automatic electricity theft detection
- Oil pipeline inspection and leak detection
- Regular and ad-hoc asset inspection (e.g. Boiler)
- Robotics for conducting maintenance on assets
- Ground patrolling and site security
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**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
- enhancing System reliability and improving KPI’s
- Reducing Safety accidents to 0
- Millions in savings for 4000 km inspection

**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:

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Details</th>
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<tbody>
<tr>
<td><strong>Safety</strong></td>
<td>Lower inspection incidents 0</td>
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<tr>
<td><strong>CM savings</strong></td>
<td>~11% in 2020 as a result of drone inspection</td>
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<tr>
<td><strong>Revenue loss avoided</strong></td>
<td>~3% after drone inspection (~100 SAR/km of line)</td>
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<tr>
<td><strong>SAIDI</strong></td>
<td>34% improvement after drone inspection</td>
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<tr>
<td><strong>ENS</strong></td>
<td>34% improvement after drone inspection</td>
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<tr>
<td><strong>ADM</strong></td>
<td>34% improvement after drone inspection</td>
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**Reduction in corrective maintenance (CM) costs** as a result of better inspection and preventive maintenance.

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### Main segments of analysis and AI Development

#### Drone operations
(Data capture through drones)

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

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

#### AI software solution
(Data analytics and reporting)

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

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

**Preventive maintenance**
Faults are reported to maintenance team for repair and recorded in ERP
The AI Predictive analytics

Data acquisition and upload
- RGB
- LIDAR
- Infrared
- Corona

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 indices)
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.
THANK YOU!

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