# Introducing MV and LV ABC to improve reliability, safety, and the resilience of the Tonga Power network

Goran Stojadinovic, MCE, MEng (El)
Product & Innovation Manager
TransNet NZ

PPA Virtual Conference, Fiji, August 26th, 2021

# Tonga Power Limited (TPL) experience with MV/LV ABC

- Distribution network – OH 11kV, 6.6kV, and LV
- Challenges - Adverse environmental conditions
  e.g. sea spray, vegetation, lines clashing, and seasonal storms
- The TPL's strategic decision - Implement MV and LV ABC (Aerial Bundled Cable)
- Tonga ABC installations so far:
  - ✓ 78 km of MV ABC
  - ✓ 551km of LV ABC

❖ Tonga Power and TransNet worked together on the development and implementation of this project

TransNet Your Partners in Power

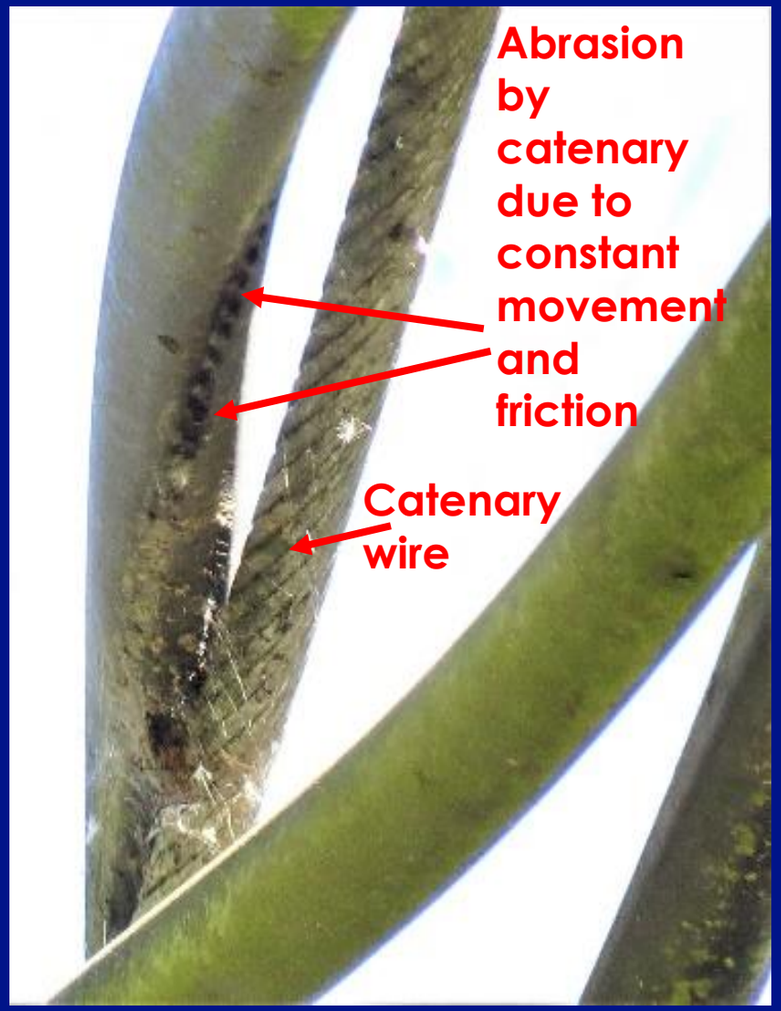
# Technical considerations re MV/LV ABC

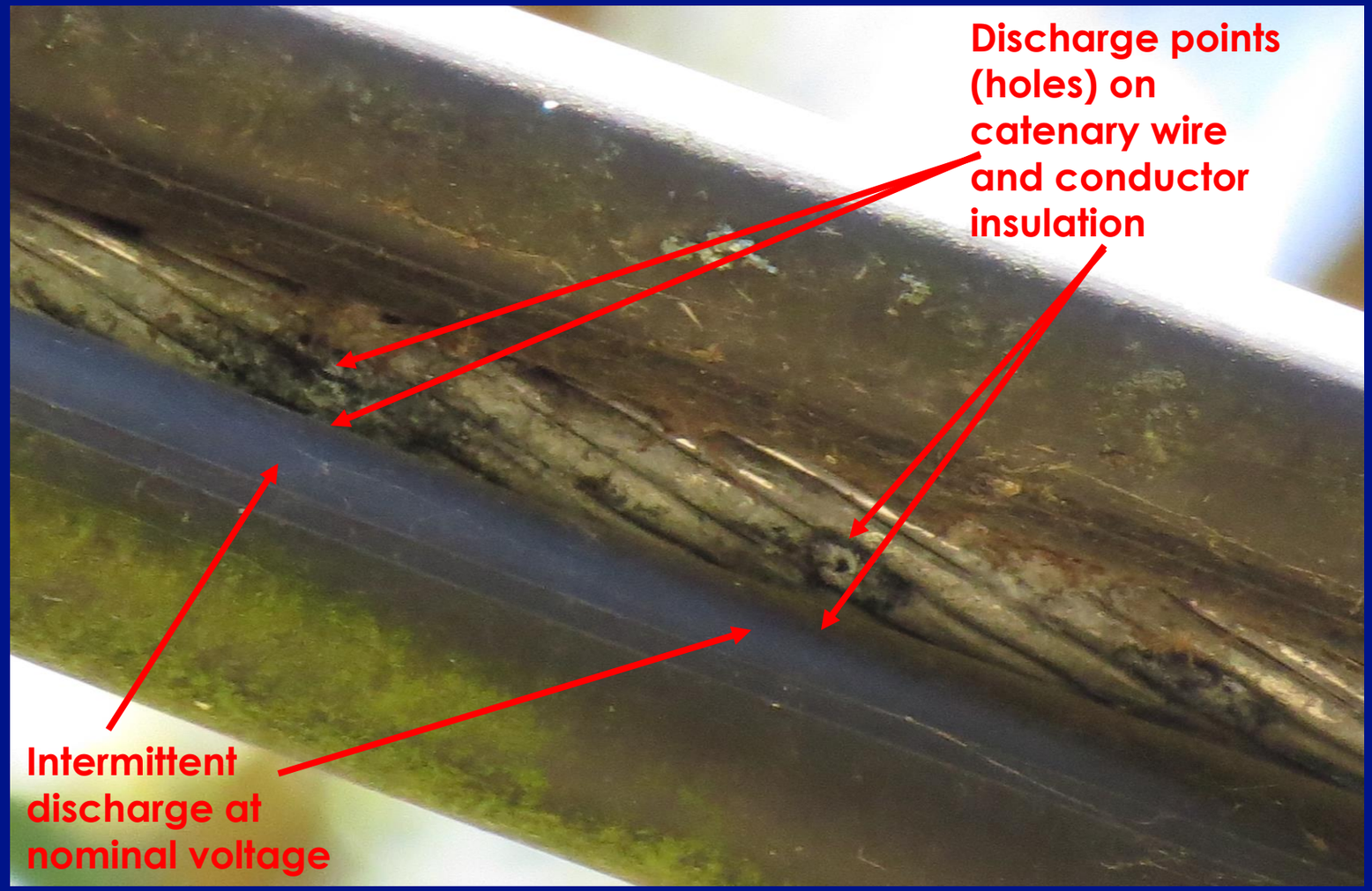
- Physical and Dielectric compatibility between MV/LV ABC and accessories e.g. insulators, attachment points, etc.
- Connection to Transformers and other OH equipment, and temporary working-earths
- The transition between LV/MV ABC and bare OH lines
- Protection against lightning strikes and transient over-voltages (e.g. NZ ECP 35 & AS/NZS 1768:2007)
- Technical standards and drawings for LV/ MV ABC
- The key design considerations – **understanding and minimizing potential failure mechanisms and common failure modes**

# The root cause of a common failure of MV ABC
## (Learning from the mistakes of others)

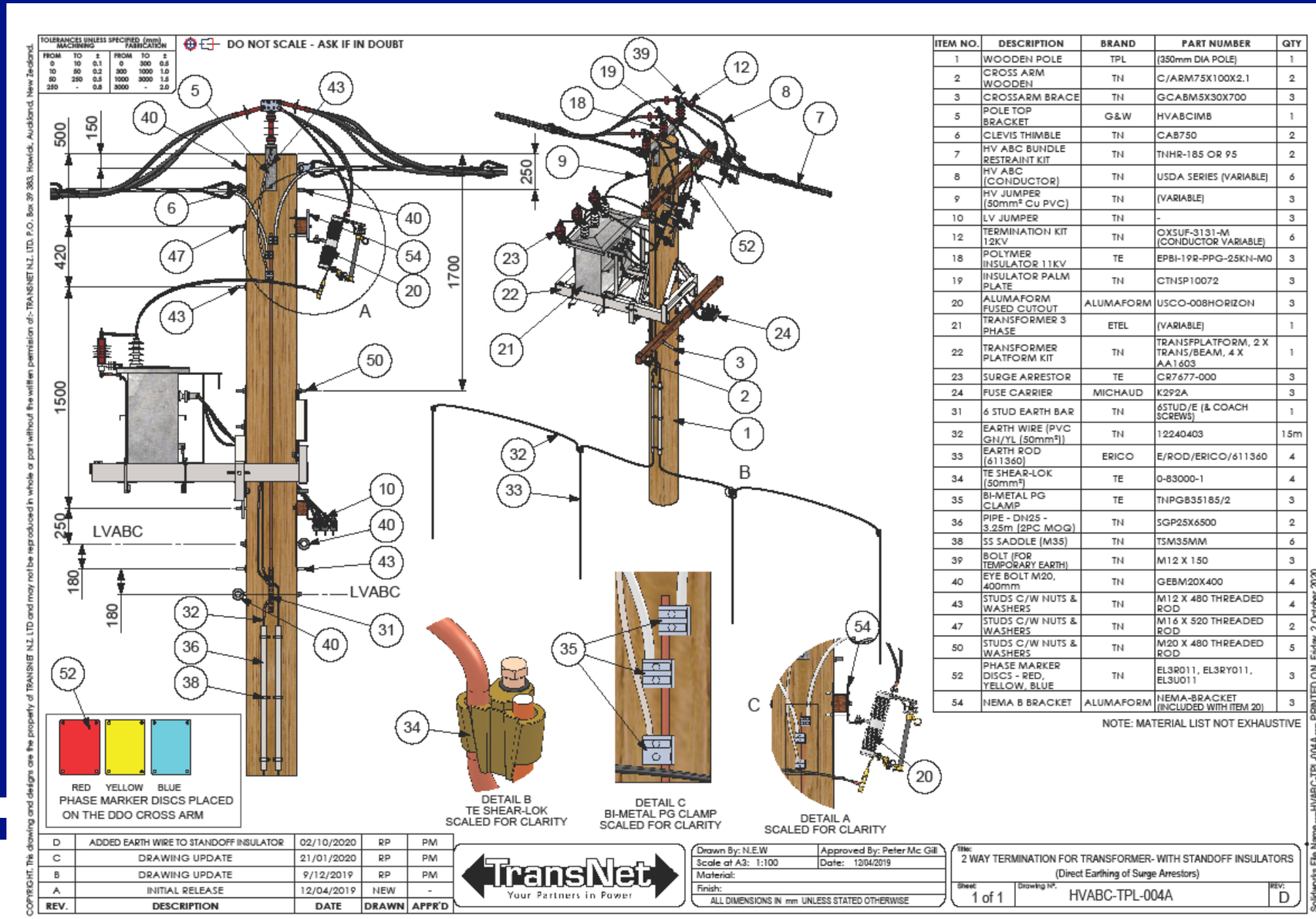
TransNet
Your Partners in Power

# Failure analysis - beginning and the end of the process



# Clear, simple, and detailed drawings/standards that do not leave room for misinterpretations and improvisations




| ITEM NO. | DESCRIPTION | BRAND | PART NUMBER | QTY |
|---|---|---|---|---|
| 1 | WOODEN POLE | TPL | (350mm DIA POLE) | 1 |
| 2 | CROSS ARM WOODEN | TN | C/ARM75X100X2.1 | 2 |
| 3 | CROSSARM BRACE | TN | GCABM5X30X700 | 3 |
| 5 | POLE TOP BRACKET | G&W | HVABCIMB | 1 |
| 6 | CLEVIS THIMBLE | TN | CAB750 | 2 |
| 7 | HV ABC BUNDLE RESTRAINT KIT | TN | TNHR-185 OR 95 | 2 |
| 8 | HV ABC (CONDUCTOR) | TN | USDA SERIES (VARIABLE) | 6 |
| 9 | HV JUMPER (50mm² Cu PVC) | TN | (VARIABLE) | 3 |
| 10 | LV JUMPER | TN | - | 3 |
| 12 | TERMINATION KIT 12KV | TN | OXSUF-3131-M (CONDUCTOR VARIABLE) | 6 |
| 18 | POLYMER INSULATOR 11KV | TE | EPBI-19R-PPG-25KN-M0 | 3 |
| 19 | INSULATOR PALM PLATE | TN | CTNSP10072 | 3 |
| 20 | ALUMAFORM FUSED CUTOUT | ALUMAFORM | USCO-008HORIZON | 3 |
| 21 | TRANSFORMER 3 PHASE | ETEL | (VARIABLE) | 1 |
| 22 | TRANSFORMER PLATFORM KIT | TN | TRANSFPLATFORM, 2 X TRANS/BEAM, 4 X AA1603 | 1 |
| 23 | SURGE ARRESTOR | TE | CR7677-000 | 3 |
| 24 | FUSE CARRIER | MICHAUD | K292A | 3 |
| 31 | 6 STUD EARTH BAR | TN | 6STUD/E (& COACH SCREWS) | 1 |
| 32 | EARTH WIRE (PVC GN/YL (50mm²)) | TN | 12240403 | 15m |
| 33 | EARTH ROD (611360) | ERICO | E/ROD/ERICO/611360 | 4 |
| 34 | TE SHEAR-LOK (50mm²) | TE | 0-83000-1 | 4 |
| 35 | BI-METAL PG CLAMP | TE | TNPGB35185/2 | 3 |
| 36 | PIPE - DN25 - 3.25m (2PC MOQ) | TN | SGP25X6500 | 2 |
| 38 | SS SADDLE (M35) | TN | TSM35MM | 6 |
| 39 | BOLT (FOR TEMPORARY EARTH) | TN | M12 X 150 | 3 |
| 40 | EYE BOLT M20, 400mm | TN | GEBM20X400 | 4 |
| 43 | STUDS C/W NUTS & WASHERS | TN | M12 X 480 THREADED ROD | 4 |
| 47 | STUDS C/W NUTS & WASHERS | TN | M16 X 520 THREADED ROD | 2 |
| 50 | STUDS C/W NUTS & WASHERS | TN | M20 X 480 THREADED ROD | 5 |
| 52 | PHASE MARKER DISCS - RED, YELLOW, BLUE | TN | EL3R011, EL3RY011, EL3U011 | 3 |
| 54 | NEMA B BRACKET | ALUMAFORM | NEMA-BRACKET (INCLUDED WITH ITEM 20) | 3 |

NOTE: MATERIAL LIST NOT EXHAUSTIVE

| REV. | DESCRIPTION | DATE | DRAWN | APPR'D |
|---|---|---|---|---|
| D | ADDED EARTH WIRE TO STANDOFF INSULATOR | 02/10/2020 | RP | PM |
| C | DRAWING UPDATE | 21/01/2020 | RP | PM |
| B | DRAWING UPDATE | 9/12/2019 | RP | PM |
| A | INITIAL RELEASE | 12/04/2019 | NEW | - |

TransNet Your Partners in Power

Drawn By: N.E.W | Approved By: Peter Mc Gill
Scale at A3: 1:100 | Date: 12/04/2019
Material:
Finish:
ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE

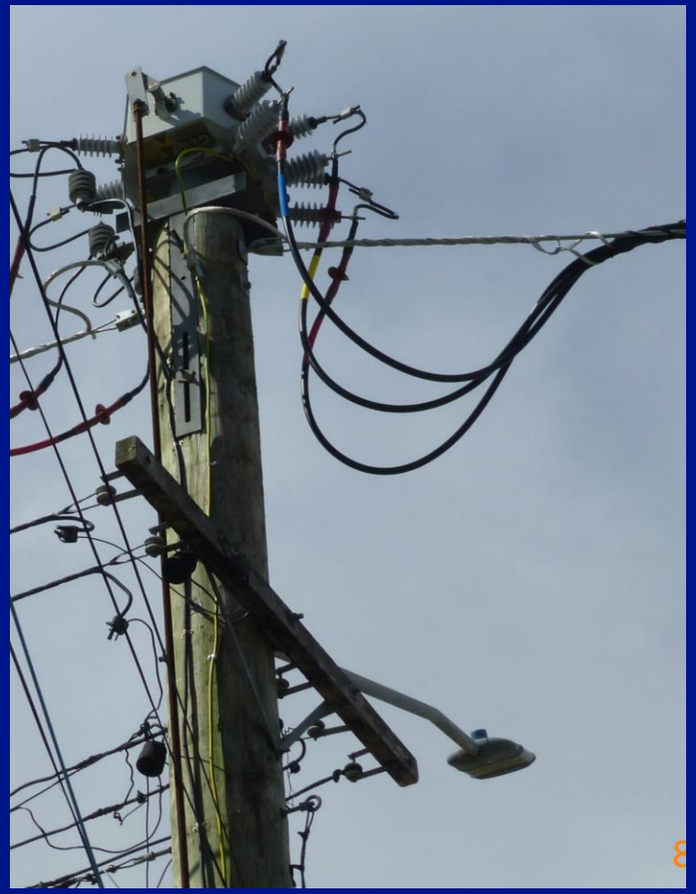
Title: 2 WAY TERMINATION FOR TRANSFORMER- WITH STANDOFF INSULATORS (Direct Earthing of Surge Arrestors)
Sheet: 1 of 1 | Drawing No.: HVABC-TPL-004A | REV: D

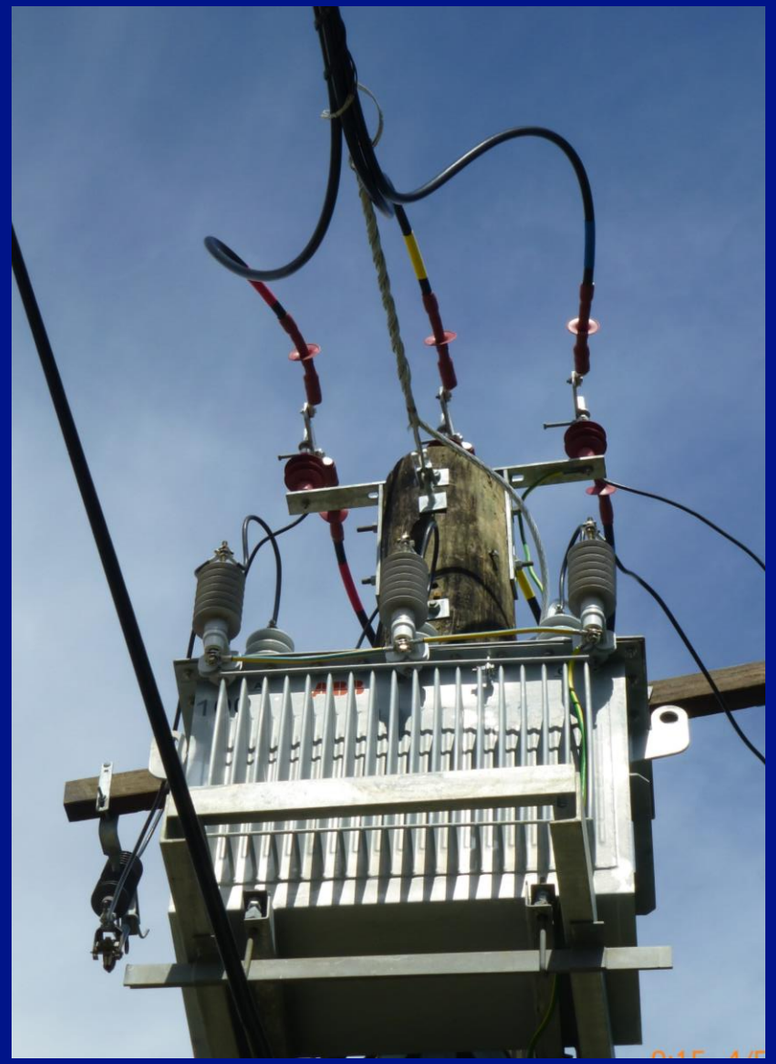


Solidworks File Name ---HVABC-TPL-004A--- PRINTED ON Friday, 2 October 2020

TransNet Your Partners in Power

# Real-life examples from TPL's MV ABC





# Tonga Power MV/LV ABC - the outcome

Network reliability and resilience:

- Significant reduction of network faults caused by storms and vegetation, and improved power supply to critical customers
- Quick recovery after storms – reduced time for repair/reinstatement

Safety and environment:

- Improved public and personnel safety
- Reduced risk of damage to property and environment
- No harm to wildlife
- Improved visual effect

# The results speak for themselves
# Cyclone Tino in Tonga (18 Jan 2020, est. 180km/h)

**Any questions?**

Goran Stojadinovic, MCE, MEE
Product and Innovation Manager, TransNet NZ
+64 21 435 753 / gorans@transnet.co.nz

TransNet Your Partners in Power