



# Data, Data, Goose?

A Tale of Efficiencies Within Electrical Safety

Brian Luo



## Climate Change Response (Zero Carbon) Amendment Act 2019

Public Act 2019 No 61  
Date of assent 13 November 2019  
Commencement see section 2

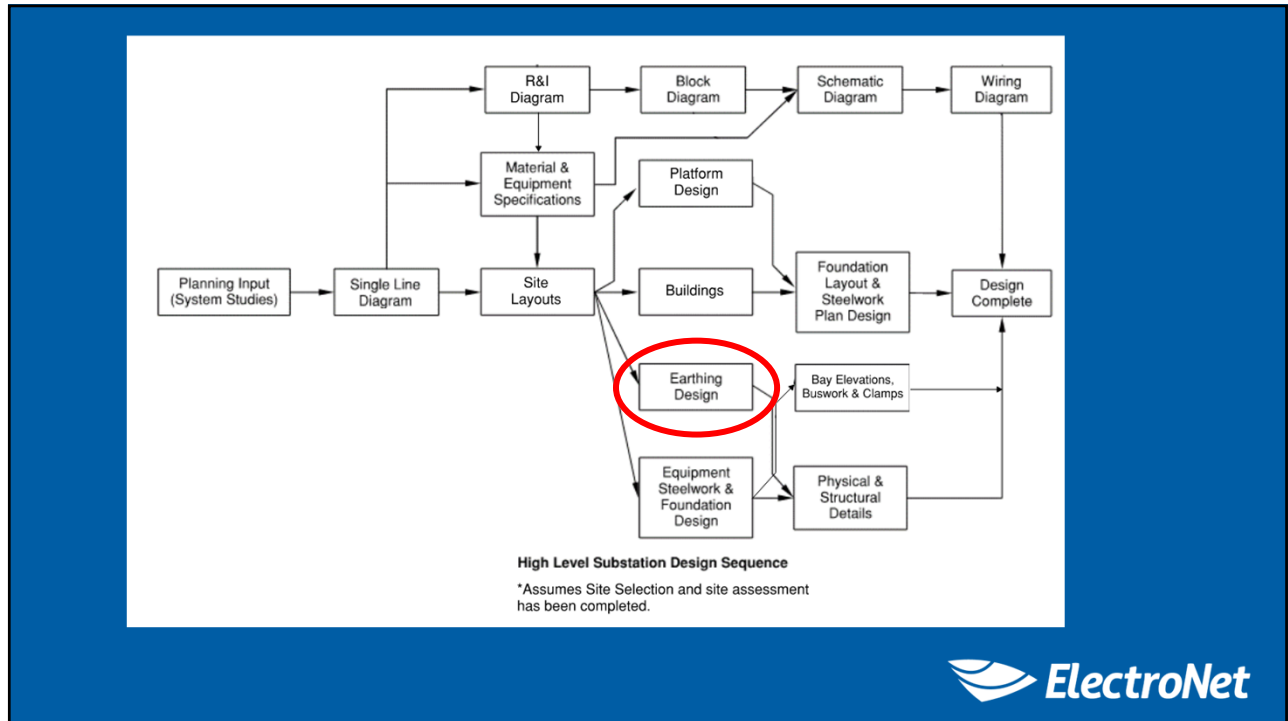


Turitea Wind Farm



Kapuni Solar Farm





# Earthing

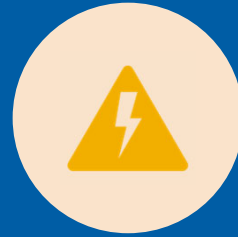
## Background/Design

## Testing



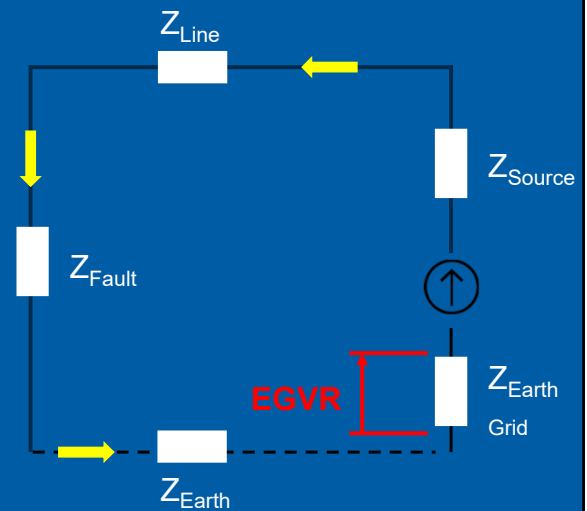
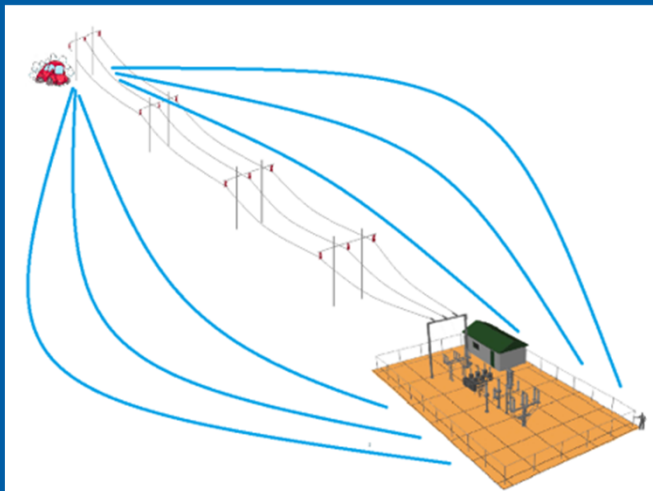


FAULT CURRENT  
RETURN PATH

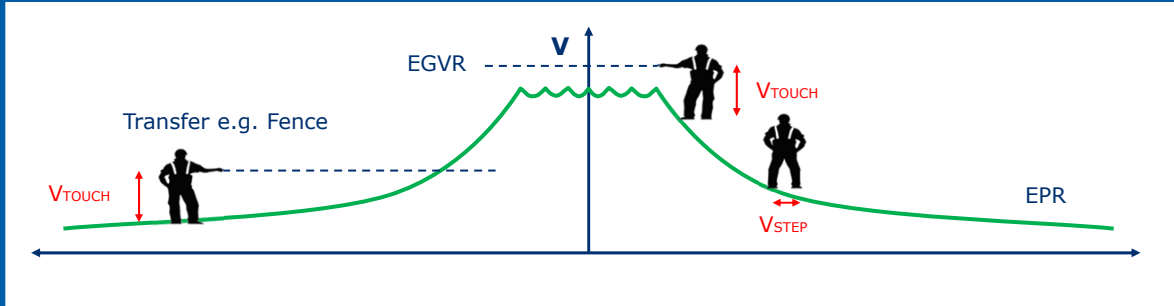


SITE SAFETY  
(VOLTAGE RISE)

 **ElectroNet**



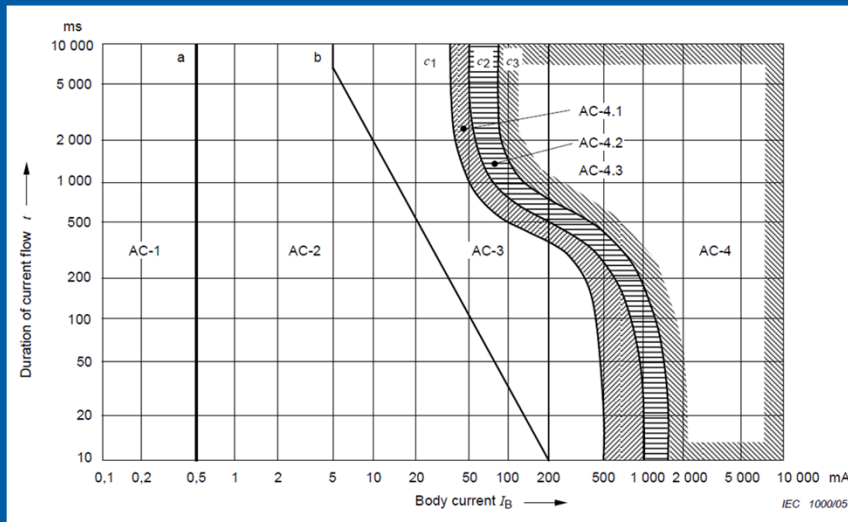
 **ElectroNet**

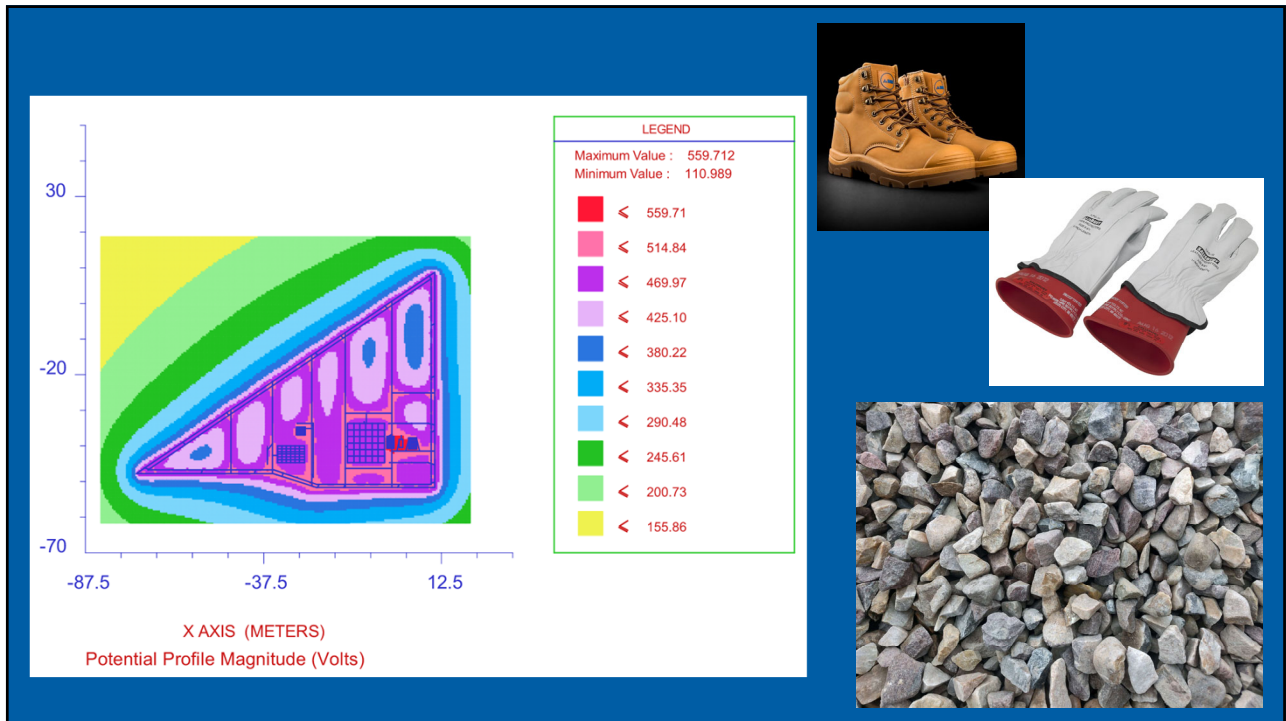
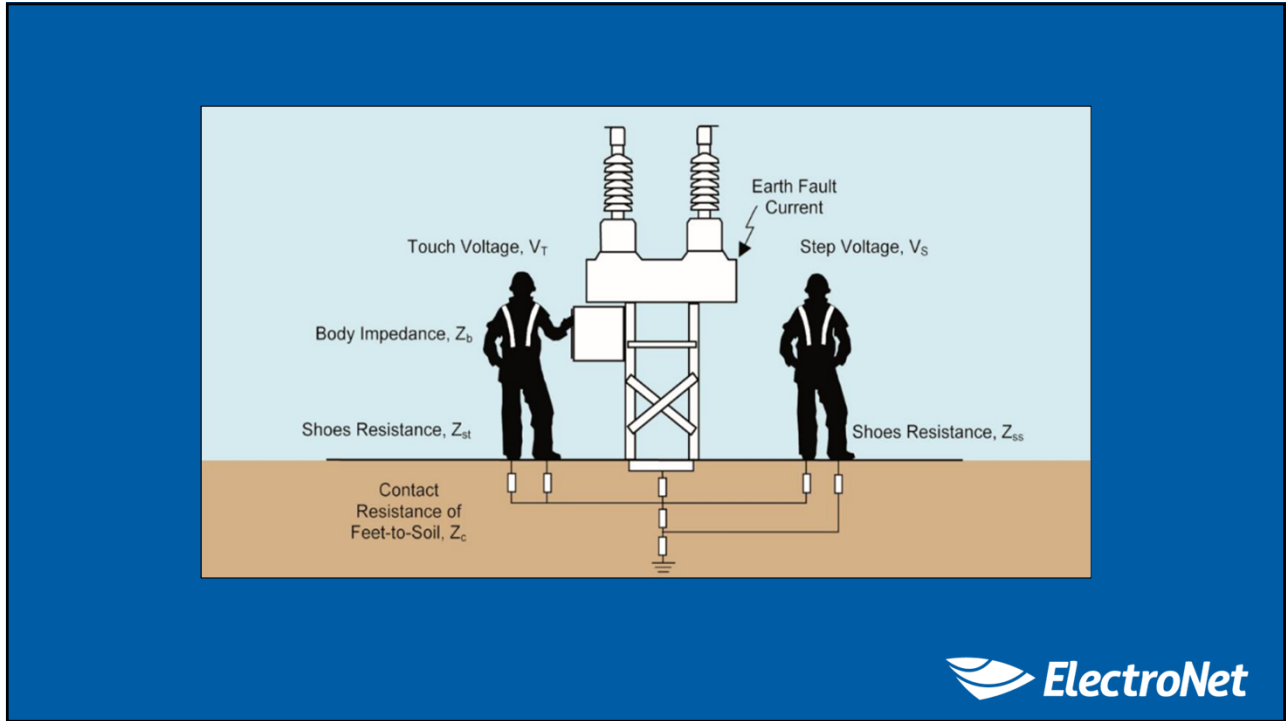


$$\text{Earth Grid Voltage Rise} = I_{\text{Fault}} \times Z_{\text{Earth Grid}}$$

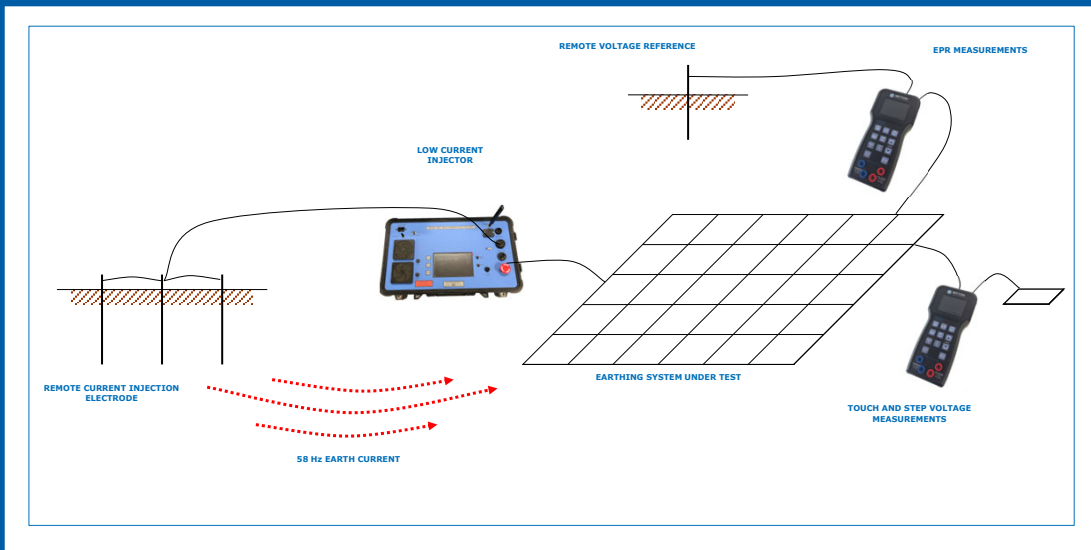


### IEC 60479





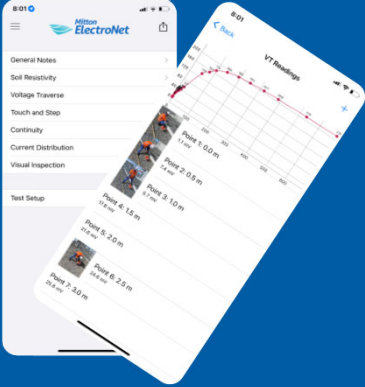
# Earth Testing




**1994** → **2016**









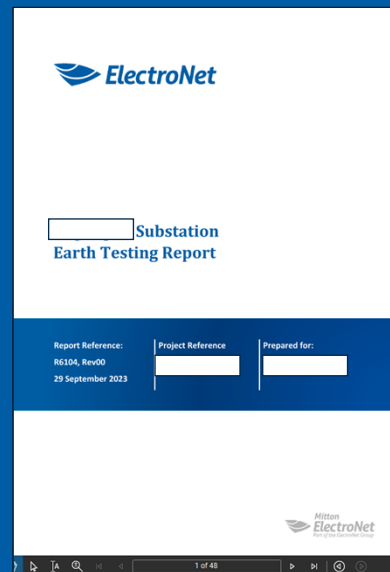
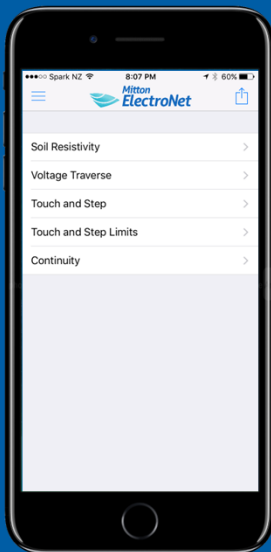




**Immediate Feedback**



**No Physical Limit**





**Summary**

Site: [Redacted]

Fault Conditions: 14,600 A, 0.1 seconds.

Injected Current: 7 A

Measured Earth Grid Impedance: [Redacted] Traverse: 0.066 Ω

Telecommunications EPR Contours: From the [Redacted] traverse: The 2,500 V contour does not exist. The 1,000 V contour does not exist. The 650 V contour is located 1 m from the edge of the earth grid. The 430 V contour is located 37 m from the edge of the earth grid.

Touch and Step: 49 Public Access Touch Voltage Measurements were taken, 2 were found to be hazardous. 83 Restricted Access Touch Voltage Measurements were taken, 1 were found to be hazardous. 0 Step Voltage Measurements were taken, 0 were found to be hazardous.

Continuity: 53 Measurements were taken, 8 measurements were recorded above 10 mΩ.

**Earth Grid Impedance**

Voltage Traverse Results

|                   |                |
|-------------------|----------------|
| EGVR              | = 460 mV       |
| Injection Current | = 7 A          |
| Z <sub>grid</sub> | = 460 mV / 7 A |
|                   | = 0.066 Ω      |

**ElectroNet**

**Existing Assets**      **New Assets**      **Record Keeping**

**ElectroNet**

# Questions?

## Credit

- Rob Orange
- Philip Renich
- Patrick Coombe
- Mark Armstrong

