

High-Voltage Earthing Performance Testing and Design

MEGAVAR

PARTNERS IN POWER

About Megavar

Earth grid testing and earthing design establish that a substation earth grid limits touch voltage, step voltage and earth potential rise to safe levels under fault conditions. Megavar measures, models and designs high-voltage earthing systems. We inject to ENA EG-1, invert the field data to a multi-layer soil model in CDEGS, and assess the result against the ENA EG-0 risk framework rather than a single fixed voltage. Founded in 2003 and Australian owned, we work from five offices and deliver across five states. We do not manufacture plant and we do not build substations, so our results carry no commercial interest in the outcome.

What We Do

Earthing performance testing, soil resistivity survey, multi-layer modelling, earth grid design and conductor rating, delivered by the engineers who do both halves.

Where We Work

From offices in Hobart, Launceston, Adelaide, Newcastle and Gladstone, delivering across Tasmania, South Australia, Victoria, New South Wales and Queensland.

Why It Matters

An earth grid is the one substation asset whose compliance cannot be judged by inspection. It has to be measured, scaled to fault current and assessed against the risk framework the standard actually uses.

Megavar at a Glance

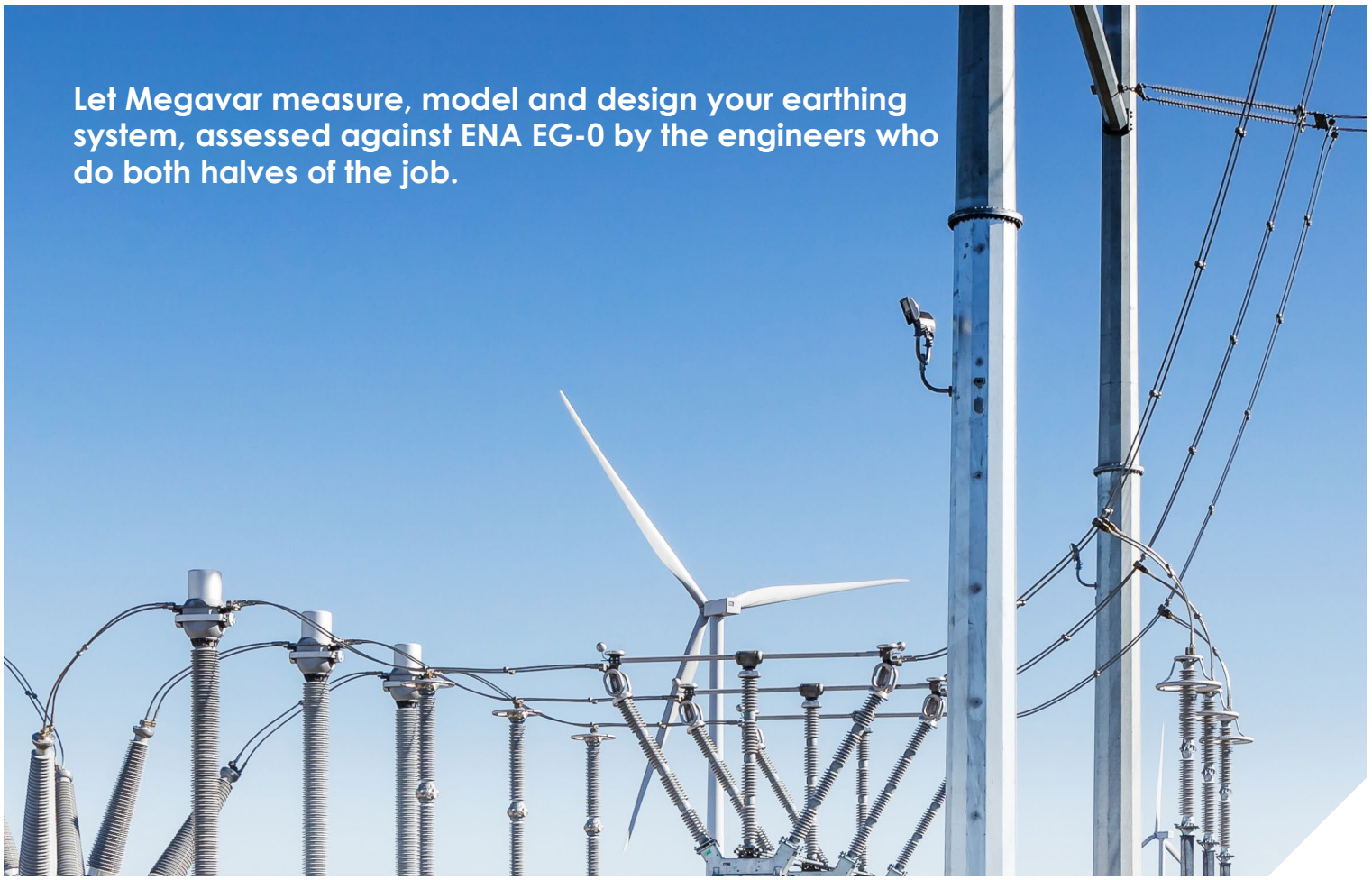
Established
2003. Australian owned and privately held.

People
57 engineers, technicians and support staff.

Offices
Hobart, Launceston, Adelaide, Newcastle and Gladstone.

Coverage
Tasmania, South Australia, Victoria, New South Wales and Queensland.

ABN
88 104 344 765



Earthing Performance Testing

What We Measure

Earth Grid Voltage Rise
Traverses on multiple routes establish the grid rise with respect to remote earth.

Fault Current Distribution
The split on earth wires and cable screens gives the grid current the grid must dissipate.

System and Grid Impedance
Both derived from the traverses and the current split, benchmarked against the historical record.

Step, Touch and Mesh Voltages
Measured on contactable metalwork, with mesh voltages mapped across the yard.

Continuity
Every bond from plant, structures, fences and gates, reported in mΩ.

How the Limits Are Derived

Fault and Contact Scenarios
Every voltage level able to cause an EPR, and each ENA EG-0 contact scenario.

Fault Rate and Duration
Taken from EG-0 and the network protection data, so limits reflect exposure.

Surface Layer and Footwear
Crushed rock resistivity and footwear per EG-0, which often decide compliance.

Risk-Based Assessment
A negligible-risk threshold per contact scenario, not one fixed voltage.

Telecommunications and Pipelines
EPR assessed against the AS/NZS 3835.1 and 4853 thresholds.

Test Method

Injection to ENA EG-1
Off-frequency injection at nominally 58 Hz, scaled by the test-to-fault current ratio.

Remote Electrode Siting
A temporary electrode sited electrically remote, typically one to two kilometres out.

Injection Lead and Return
A temporary lead, or an out-of-service line or cable screen where terrain prevents a run.

Working on a Live Site
Normally done in service. Where a return path cannot be measured live, the report says so.

Instrumentation

High-Current Injection Sets
Red Phase and Mitton sets, with a Transline set for line and feeder circuits.

Earth Resistance Testers
AEMC instruments for electrode resistance and Wenner resistivity traverses.

Continuity Measurement
Low-resistance measurement of bonds and connections, in mΩ.

Calibration and Ownership
Owned rather than hired, calibrated to NATA-traceable standards.

Design, Modelling and Reporting

Soil Modelling and Grid Design

Wenner Resistivity Traverses
Multiple traverses at spacings out to 32 m or beyond, on the ground the grid occupies.

Multi-Layer Soil Model
Field data inverted in CDEGS to a two or three layer model, with the fit reported.

Earth Grid Design
Geometry, conductor routing, electrodes and surface layer, set against soil and fault data.

High-Resistivity Ground
Deep electrodes, ground enhancement and grid extension where conventional design fails.

Conductor Sizing and Rating

Thermal Sizing
Minimum size from fault current and duration, by the ENA EG-1 method.

Temperature Limits
250°C bare with brazed joints, 160°C PVC insulated, 40°C ambient.

Clearing Time
A conservative 2 s per EG-1 unless the protection study says otherwise.

Mechanical Minimum
70 mm² cable or 25 × 3 mm copper strap, above the AS 2067 minimum.

Verification
Installed sizes checked on site against the calculation.

Reporting

Measured Against Calculated
Every measurement tabulated against its limit, with a photo of the test point.

Figures, Not Assertions
Traverse routes, mesh voltage plots, soil fits and voltage contours shown.

Independent Review
Author, reviewer and approver are separate named engineers.

Retest Intervals
AS 2067 nominates 10 to 15 years performance, 1 to 3 years inspection.

Standards Applied

AS 2067
Substations and installations above 1 kV a.c.

ENA EG-0, DOC 025
Power System Earthing Guide. The risk framework for limits.

ENA EG-1, DOC 045
Substation Earthing Guide. Injection and conductor sizing.

IEEE Std 80 and Std 81
Grounding safety; resistivity and impedance measurement.

AS/NZS 3835.1 and 4853
EPR for telecommunications and metallic pipelines.

Credentials and Commitment

Accreditations and Licences

Certified Management Systems
ISO 9001, ISO 14001 and ISO 45001, certified since 2015.

Certified Scope
Planning, design and delivery of high voltage electrical and engineering projects, including project management, engineering consultancy and equipment rental.

Electrical Contractor Licences
Held in every Australian state: NSW 284109C, VIC 21203, QLD 73595, SA PGE 267537, WA EC010840 and TAS 947267.

Insurance
Professional indemnity $10 million, public and products liability $20 million, cyber liability $1 million.

Test Instrumentation
An owned Omicron and Megger fleet including CMC 356 and CMC 500 relay test sets, CPC 100 primary test set, CIBANO 500 circuit breaker analyser, TESTRANO 600 and FRANEO 800 transformer test systems, MPD 600 partial discharge system and MIT and DLRO testers, calibrated to NATA-traceable standards.

Next Step
Read more about earthing performance testing and design on megavar.com.au
Request a quote
1300 730 499 | service@megavar.com.au

Clients and Sectors

Networks
Transgrid, ElectraNet, TasNetworks, Essential Energy, Evoenergy, Powercor, AusNet, Western Power, Zinfra and Jemena.

Principal Contractors
Downer, Ventia, RJE, Enerven, CPP, ACLE, RBD and Worley.

Renewable Generators and OEMs
Acciona, Vestas and Goldwind.

Industry
Alcoa Portland.

Sectors
Network augmentation, wind, solar and battery storage connections, and heavy industry.

Other Megavar Capability Statements
One is available for every Megavar service line. Ask your Megavar contact or email service@megavar.com.au.

Why Megavar

Design and Testing in One Business
The people testing the system understand how it was designed.

Independent
No plant to defend and no construction programme to protect.

Measured and Modelled In-House
Injection testing and CDEGS modelling by the same engineers.

Records That Survive Audit
Results, calculations, sign-offs and defect registers, as one pack.

Our Principles

Integrity
When Megavar does it, you know it has been done right.

Responsiveness
When clients need us most, we will be there every time.

Teamwork
Only together can we achieve great outcomes.

Accountability
We hold each other to high standards, and fix what we get wrong.

Safety
Looking out for each other gets us home safe.

Speak to our team today

megavar.com.au

MEGAVAR

service@megavar.com.au

1300 730 499