GROUND-MOUNT AND ROOF TOP

CAPABILITIES STATEMENT

OPERATIONS & MAINTENANCE

earthconnect Pty Ltd

Renewable Energy Specialists

OUR COMPANY

Turn-Key Solar Energy Solutions

Supporting sustainability efforts one project at a time.

earthconnect is a business dedicated to making an environmental difference through renewable energy and energy efficiency technologies.

Established in 2009, earthconnect are extremely proud to be entering our twelfth year of providing solar energy solutions to the commercial, industrial and large scale sectors of the renewable energy market.

As experienced providers of engineering, procurement and construction (EPC) solutions, we are highly skilled in project management, engineering and delivery.

We bring expert advice and knowledge to all facets of project planning and implementation including feasibility, preliminary design, critical design, construction, testing, commissioning, operation and maintenance.

Our capabilities

earthconnect has independently delivered an extensive and impressive array of solar energy solutions.

Amongst our activities, we currently manage the operation and scheduled maintenance programs for a 5 megawatt solar farm — a project we engineered, designed, constructed and delivered in early 2020 for one of our many long-standing commercial solar clients.

In addition to this, we currently provide scheduled maintenance programs for several 100 kilowatt solar projects.

We are immensely proud of our many years of operations delivery in this innovative industry and look forward to a future of exciting opportunities.

What is **scheduled** and **preventative** and why is it so important?

Scheduled Maintenance

Scheduled maintenance service works to maximise equipment reliability and is primarily driven by equipment manufacturers — much like the scheduled services that you arrange for your own motor vehicle.

To determine how regularly components should be serviced, manufacturers rely on a multiplicity of factors including recommendations from their engineers and Mean Time Between Failures (MTBF) data collated from the manufacturer's many service agents.

Such schedules are primarily designed to minimise the company's exposure to litigation driven by product failure. Documented evidence indicating recommended services have been completed must be available at the time of a warranty claim; otherwise the manufacturer may not warrant a repair or replacement, leaving an asset owner exposed to expensive costs.

Preventative Maintenance

On the other hand, **preventative maintenance** programs evolve over time. Once a maintainer has become more familiar with an asset or system, they are able to develop an understanding as to where weaknesses lie and can establish a maintenance program that specifically target these issues.

There may be some guidelines around how often components should be inspected but this timeframe can vary greatly depending on the local environment and specific operating conditions.

COMPREHENSIVE AND THOROUGH. 24/7 SOFTWARE MONITORING TO ENSURE OPTIMAL SYSTEM PERFORMANCE .

PICTURED:
One of our senior staff members conducting a system maintenance and performance review.

Many aspects of this monitoring are possible via remote access but detailed data extraction needs to be performed on location.

Remote monitoring of our larger commercial solar installations is performed daily and is an integral step in ensuring that these systems are performing at optimum levels.

QUALITY ASSURANCE

MECHANICAL, STRUCTURAL AND VISUAL INSPECTIONS

Cleaning is a much-discussed component of scheduled maintenance. It is understood that cleaning panels does play a role in increased output, but by what factor?

With the exception of heavily soiled panels, the cost of cleaning compared to the corresponding increase in yield is rarely justified. If the project's location is such that it does experience multiple heavy rain events per year, cleaning in most cases wouldn't be recommended.

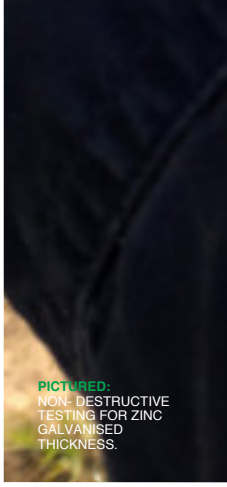
We never push our clients into panel cleaning but instead, make an assessment as to the extent of soiling when attending a site and then discuss options.

One of the many essential processes performed as part of scheduled maintenance (and as a requirement of manufacturer warranty cover) is the investigation of zinc-galvanised coating in the main support piles.

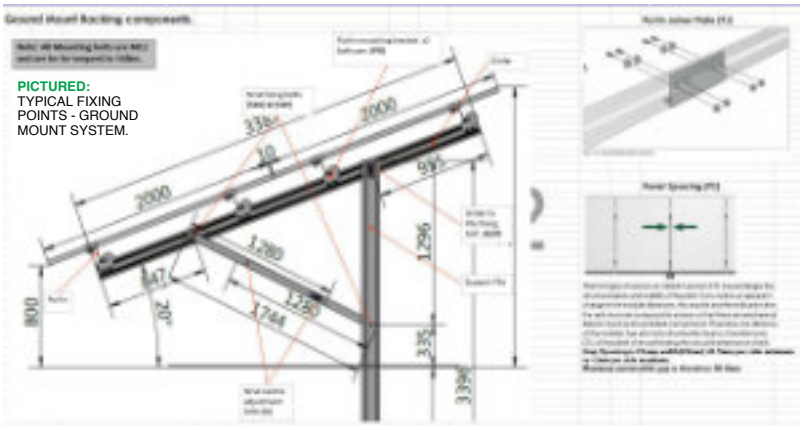
This task is carried out using a non-destructive testing (NDT) thickness gauge, designed to check the thickness of the coating and is conducted in several marked locations every 12 months in order to monitor degradation.

Depending on the ground mount design, there may be as many as two thousand piles required to support a 5 megawatt solar farm—by no means a small task!

PICTURED: VOC STRING TESTING.



PICTURED: NON- DESTRUCTIVE TESTING FOR ZINC GALVANISED THICKNESS.



PICTURED: TYPICAL FIXING POINTS - GROUND MOUNT SYSTEM.

PICTURED: BOLTS MARKED AFTER TORQUE TEST HAS BEEN COMPLETED.

ELECTRICAL INSPECTIONS/TESTING, VISUAL AND PHYSICAL CHECKS

These tests and inspections must be carried out in-line with the site's specific 'Installation and Safety Management Plan' (ISMP) protocols and guidelines, and are developed in line with QMS ISO 9001:2015. **These inspections may include:**

PICTURED BEHIND: TYPICAL ROOF-TOP DC COMBINER BOX - STRING TESTING IS BEING PERFORMED ON A MEGAWATT ROOF MOUNT INSTALLATION.

Individual string testing is a valuable tool to assist in locating a system performance-based issue, as a small 5 megawatt solar farm may consist of 500 to 600 individual DC strings.

PICTURED RIGHT: ONE OF MANY GROUND MOUNT COMBINER BOXES.

Every DC-string is terminated in one of many of these combiner boxes. Both the positive and negative conductor of every string is protected by an inline fuse.

PICTURED RIGHT: VOC STRING TESTING UNDERWAY INSIDE ONE OF MANY COMBINER BOXES.

PICTURED RIGHT: INFRARED TESTING OF SOLAR PANEL REAR JUNCTION BOXES.

SETTING THE BASELINE FOR PV MODULE DEGRADATION

A variety of factors underpin the performance of solar panels and it is important that these performance factors are identified and understood.

Depending on the age of the solar farm, the size of the panel chosen and the continual improvements made in solar panel efficiencies, panel quality can vary from approximately 2250 to 2800 panels per megawatt.

By employing infrared scanning drone technology to scan the solar array whilst it is producing power, 'hot spots' or 'cold spots' — symptomatic of issues within the solar array — can be adroitly identified.

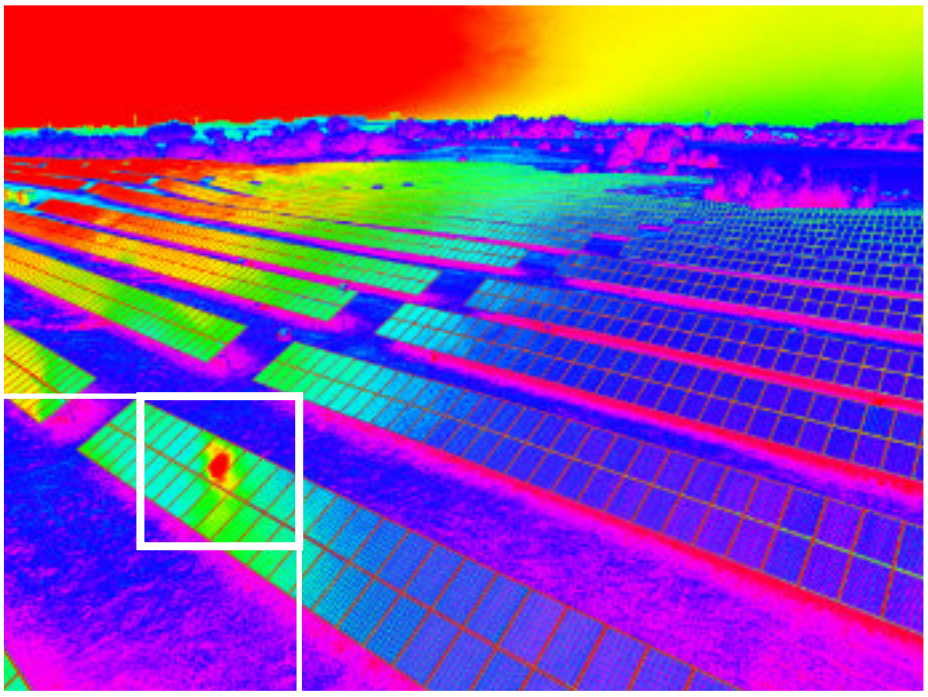
A solar DC-string may contain approximately 25 panels wired together. Following the analogy that a chain is only as strong as its weakest link, just one of those panels developing a high resistance (HR) fault will drag down the output of that entire string; underscoring the invaluable role that string testing and infrared heat scanning plays in ensuring the efficiency and productivity of solar panels.

A complete site drone thermal imaging scan may precede string testing, or vice versa. A smaller hand-held thermal device can be used post string testing to scan and locate an individual faulty panel within that string.

Through utilising test equipment such as a Seaward Solar Utility Pro, we can conduct detailed performance testing on each individual DC-string, allowing us to form an output baseline.

This baseline can then be compared to the outputs of subsequent years in order to detect critical symptoms of panel degradation.

When performed in parallel with thermal imaging, any solar panel which may be underperforming or has developed a fault can be efficiently detected.



PICTURED RIGHT: HOT SPOTS DETECTED USING THERMAL SCANS USING A DRONE, AS SHOWN ABOVE.

INVERTER(S) AND CENTRALISED POWER, STATION UNIT(S)

PICTURED LEFT:
SEAWARD STRING TESTING BEING CARRIED OUT FROM THE DC SIDE INSIDE ONE OF SMA'S MVPS (MEDIUM VOLTAGE POWER STATION). CENTRALISED INVERTER/TRANSFORMER.

We carry out tests and inspections in line with the site's ISMP protocols and guidelines, and QMS ISO 9001:2015

As with electrical inspections, these tests and inspections must be carried out in accordance with the site's specific 'Installation and Safety Management Plan' (ISMP) protocols and guidelines.

Checks and inspections must be conducted in accordance with the manufacturer's specifications, guidelines and maintenance manuals.

These tests and checks differ between the various powerplant manufacturers and so will require customisation depending on your specific site configuration.

HV SWITCH ROOM, MSB AND NPU (NETWORK PROTECTION UNIT)

Industrial sites typically have a designated high voltage **'switch room'** area.

In a ground mount (solar farm) environment, the switch room is comprised of a low voltage area and a high voltage area.

High voltage areas may only be accessed by suitably trained, qualified and licensed personnel.

PICTURED LEFT:
AN MSB AT ONE OF OUR COMMERCIAL INSTALLATIONS.

WE TREAT EVERY SITE AS IF IT WERE OUR OWN. TRUST IN EARTHCONNECT TO DEVELOP A SCHEDULED MAINTENANCE PROGRAM FOR YOUR NEXT, OR EXISTING, SOLAR PROJECT.

PICTURED ABOVE:
2.0 MW (APPROX. 6000 PANELS) PROJECT IN REGIONAL NSW.

Talk to one of our specialists today.

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