

ADVANCED INSPECTION SERVICES & SOLUTIONS

QUANTITATIVE & QUALITATIVE TESTING SERVICES UTILISING
WORLD-LEADING INNOVATIVE TECHNOLOGIES



2DK SOLAR FARM INSPECTION

INTRODUCTION

As of Q3 2021, the UK has approx 1,400 operational or in-construction large scale solar farms, totaling approx 8.5GW of installed capacity. Over 90% of which was installed within the subsidy-driven solar boom between 2011-2017.

Based on visiting over 10% of these sites, 2DegreesKelvin have gathered visual evidence and test data which indicates that over 3/4 of the solar boom built assets have widespread mechanical damage or systemic issues which will eventually cause significant production impacts.

It is therefore unlikely that the UK operational fleet will last their 25 year design life without significant assessment and investment in upgrades and repowering strategies.

2DegreesKelvin aim to support asset owners and managers, EPCs, developers and O&M companies with a range of advanced inspections services and solutions to tackle this fleet-wide challenge.

In this brochure we identify our main processes and approaches as well as world-leading technology and services partnerships which we bring to the UK market.



JOHN DAVIES

CEO of 2DegreesKelvin

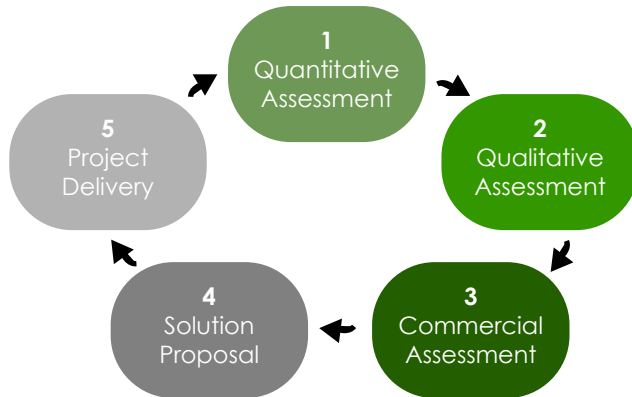
"The UK is one of the world leaders in large scale solar deployment and we have achieved great things over the last decade which we should all be proud of.

However, in our haste to deploy at pace, poor development and design, lack of quality control, wrongly selected equipment and materials, and a cycle of winter builds has incorporated inherent defects in our utility-scale fleet which will inevitably impact on the longevity of these assets."

KNOWLEDGE IS POWER

Knowledge is power, in every sense of the phrase when it comes to solar and every watt counts. To be in an informed position with your assets you need all the facts. Whether this be string tests, shunt resistance testing, IV-Curve tests, visual inspections, IR drone surveys or more advanced methods such as Electroluminescence and/or flash testing, the outcome of the exercise needs to be justified, needs to be useful in terms of reaching our clients objectives and it needs to be presented in a suitable manner. Introducing the 2DegreesKelvin Road2Repower Process:

ROAD2REPOWER 5 STEP PROCESS



1. Quantitative Assessment – Initial assessment of what the problem is and the scale of the problem. If you don't know how widespread the problem is then how do you know what testing methodology and sample size to choose?

2. Qualitative Assessment – Utilising a range of advanced inspection and testing methods, we aim to qualify what the issues are through evidence and data.

3. Commercial Assessment – Using the outcome of the quantitative and qualitative assessments, we develop an impact model to illustrate compounded affects.

4. Solution Proposal – Following the first 3 steps, we provide a detailed technical and commercial proposal aligned with your outcome objectives, which clearly communicates your strategic options.

5. Project Delivery – Combining over 20 years of heavy industry project delivery, the 2DegreesKelvin team have been designed to deliver complex, high-volume, quality focused projects on time and on budget. We work as an extension of our clients teams to efficiently these projects time after time.

WHAT'S THE PROBLEM?

TOP 5 ROOT CAUSES OF FLEET STATUS

1

Poor development and design standards

2

Poor selection of components and materials

3

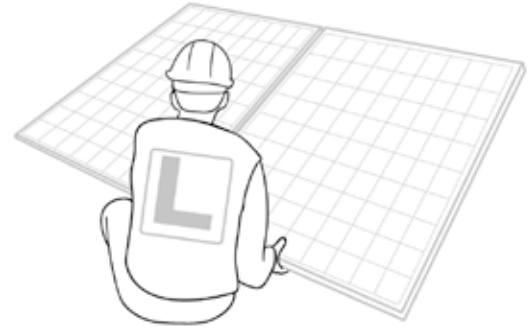
Poor construction standards (EPC profit focused)

4

Total lack of quality assurance (all phases)

5

Winter construction (annual cyclic subsidy reduction)



QUALITY MANAGEMENT

2DegreesKelvin are a one-stop-shop for solar farm quality management, providing both upstream solar component quality management services as well as downstream on-site quality management services.

UPSTREAM QUALITY MANAGEMENT

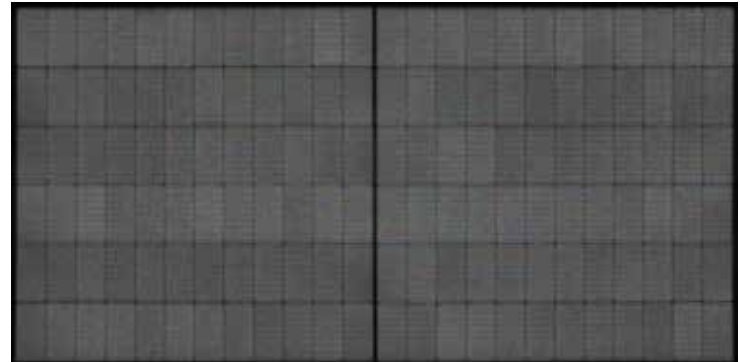
Utilising our world-class partners, Clean Energy Associates (CEA), the leading supplier of technical due diligence and engineering services for solar PV and energy storage around the globe. Offering:

- Procurement strategy support
- Factory & shipping audits
- Supply chain management

DOWNSTREAM QUALITY MANAGEMENT

2DK offer asset owners & EPCs the following downstream quality management services:

- Design & procurement verification
- Construction oversight
- Post-shipment & post-installation module testing



TESTING SERVICES & SOLUTIONS

2DK offer a wide range of advanced testing services & solutions to service the UK operational and new-build utility-scale solar fleet. These include:

- Mobile module test lab (EL & Flash)
- Module to frame earth leakage testing (High-Pot)
- Backsheet material ID & longevity testing
- Post-shipment & in-situ EL testing
- DC string testing & troubleshooting (up to 1500V)
- IV curve tracing (up to 1500V)
- AC system & component testing
- Meteo equipment testing & troubleshooting
- Inverter testing & troubleshooting
- HV equipment testing & troubleshooting

Our team of experienced & qualified engineers and associates are able to advise on bespoke scopes and strategic outcomes. Our operatives can integrate into your teams, delivering test outcomes to align with your desired format.

Early interaction with projects and operational conditions enables the 2DK team to design the optimum testing scope of works to meet and exceed our clients expectations.



TECHNOLOGY PARTNERS



ADVANCED DRONE SERVICES

Supporting the entire solar project life-cycle, 2DK offer a range of powerful & complementary drone services to add value and insights to your solar project.



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DEVELOPMENT PHASE DRONE WORKS

- Pre-construction site surveys (photo montage)
- 2D authographic surveys
- Topographic surveys

CONSTRUCTION PHASE DRONE WORKS

- Construction progress reporting
- Promotional video montage
- Digital twin & asset record building

OPERATIONAL PHASE DRONE WORKS

- IR-Thermography surveys
- EL surveys
- Visual defect surveys

TECHNOLOGY PARTNERS



ASSET IMPROVEMENT & OPTIMISATION

After visiting and conducting services on >10% of the UK operational fleet, it is clear that due to the root causes of the fleet status (detailed on page 5), that a substantial proportion of these assets will not make their intended design life of 25 years.

As of Q4 2021, the average asset age in the UK is 7.5 years old and there is already an influx of high volume exchanges, warranty claims and improvement & optimisation projects being deployed to address these widespread premature ageing issues.

TAs, EPCs and O&Ms are not set up to deliver high volume, complex and data heavy like these. 2DK as a company has been specifically designed to deploy these types of projects with service excellence in mind. Projects such as:

- Module exchanges / Spares creation
- DC strings & connector replacements
- Retrofitting optimisation solutions (PADCON)
- Inverter & HV equipment exchanges
- Revamp & Repower studies & project execution



Boosting asset performance with PID healing technology

TECHNOLOGY PARTNER



REVAMP & REPOWER

The terms revamp & repower are relatively new to the solar PV industry, and essentially describes the collective adjectives to increase the assets performance, reliability, and life.

Most solar farms are designed to last 25 years, with some even extending design life to 30-40 years. However, when you appreciate the speed in which many sites were/are constructed under subsidy pressure in solar booms around the world and the relatively immature design, procurement & construction standards employed. Systemic failures, premature deterioration and component obsolescence will prevail and along with it will be a influx of warranty cases, legal adjudications and losses to investors.

What's needed as this new market emerges is professional engineering & project management specialists to ensure these complex retrofitted projects are suitably engineered and delivered.



2DK & ALT ENERGY PARTNERSHIP

To meet this emerging market need & to attempt to elevate standards within the sector, 2DegreesKelvin have joined forces with ALTENERGY in a Revamp & Repower Partnership, to offer the market best-in-class fully wrapped service solutions. We have jointly developed a R&R Excellence Standard which defines the minimum levels of quality which we will deploy on any given project.

We are extremely excited to combine our teams experience, resources & supporting networks to offer the gold-standard in UK based Revamp & Repower project delivery.





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IN-SITU ELECTROLUMINESCENCE TESTING - UNDER MOONLIGHT



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