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pv magazine webinars

Understanding airplanes vs drones in aerial inspection

6 February 2024

11:00 am – 12:00 pm | EST, New York City
4:00 pm – 5:00 pm | GMT, London
5:00 pm – 6:00 pm | CET, Berlin

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Welcome!

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Do you have any questions? ❓ 🙋

Send them in via the Q&A tab. 👉 We aim to answer as many as we can today!

You can also let us know of any tech problems there.

We are recording this webinar today. 📹

We‘ll let you know by email where to find it and the slide deck, so you can re-watch it at your convenience. 👀 💡

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Understanding Airplanes vs Drones in Aerial Inspection

Agenda

- Zeitview: Advanced Inspection Solutions for Solar
- Introduction to Aerial Thermography
- Airplanes or Drones?
- So What Collection Methodology is Best for My Sites?
- Example Scenarios
- 2024 European Flight Routes
- Q&A

Zeitview: Advanced Inspection Solutions for Solar

Zeitview by the Numbers

We are the market leader for solar PV aerial inspections and lifecycle analysis

11,000+
Contracted inspections to date

80,000+
Pilots in Network

300GW
Of installed PV capacity scanned to date*

$62M+
Recoverable energy loss detected per year
>1% mean DC power loss/site

200MW
With our piloted aircraft, we can scan up to 300MW/hour

70+
Countries Serviced

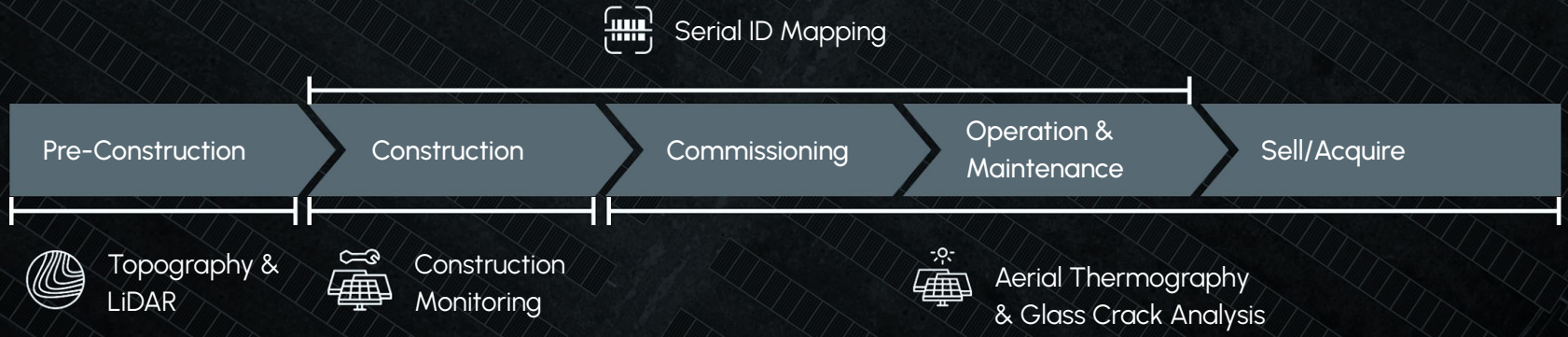
Zeitview also Supports:

- Wind
- Property & Facility MGMT
- Telecom
- Utilities

Solutions for the Asset's Life Cycle

Zeitview Solar Insights delivers advanced inspection software and services for developers, owners, and operators that accurately and cost effectively analyze solar assets.

- Ensuring long term viability and profitability of projects
- Early identification of issues and risk factors
- Predictability of future performance



Introduction to Aerial Thermography

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Advantages of Aerial Thermography

Safety
Aerial inspections keep workers at a safe distance from mid or high-voltage, fragile equipment, reducing a lot of occupational risks. Potential safety hazards can be identified and localized prior to on site work is

Efficiency
Aerial inspections are fast and accurate, so facility managers can get an up-to-date assessment of the state of the equipment of the entire site. The imagery and data collected help operators prioritize and optimize maintenance efforts.

Increasing and guarding production
Aerial sensors spot systemic issues before they spread and damage other parts of a module like glass, frame and mounting structure—or even entire strings. Permanent damage to expensive capital equipment is easier to avoid than fix.

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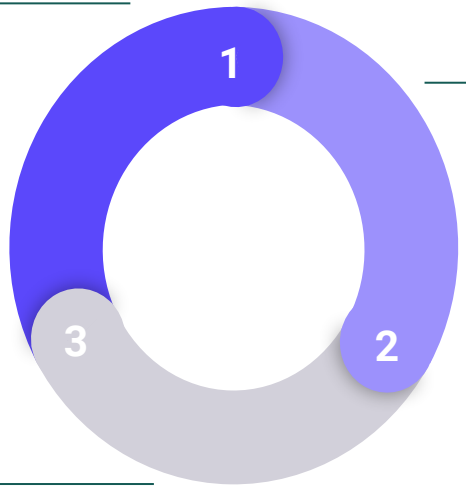
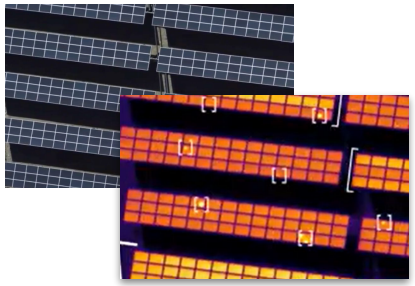
From Inspection to Insights

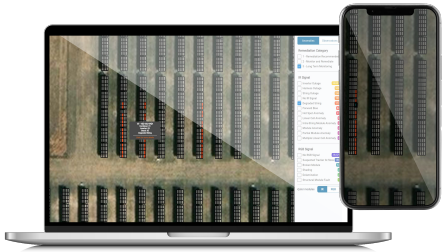
Inspect



Analyze



Act



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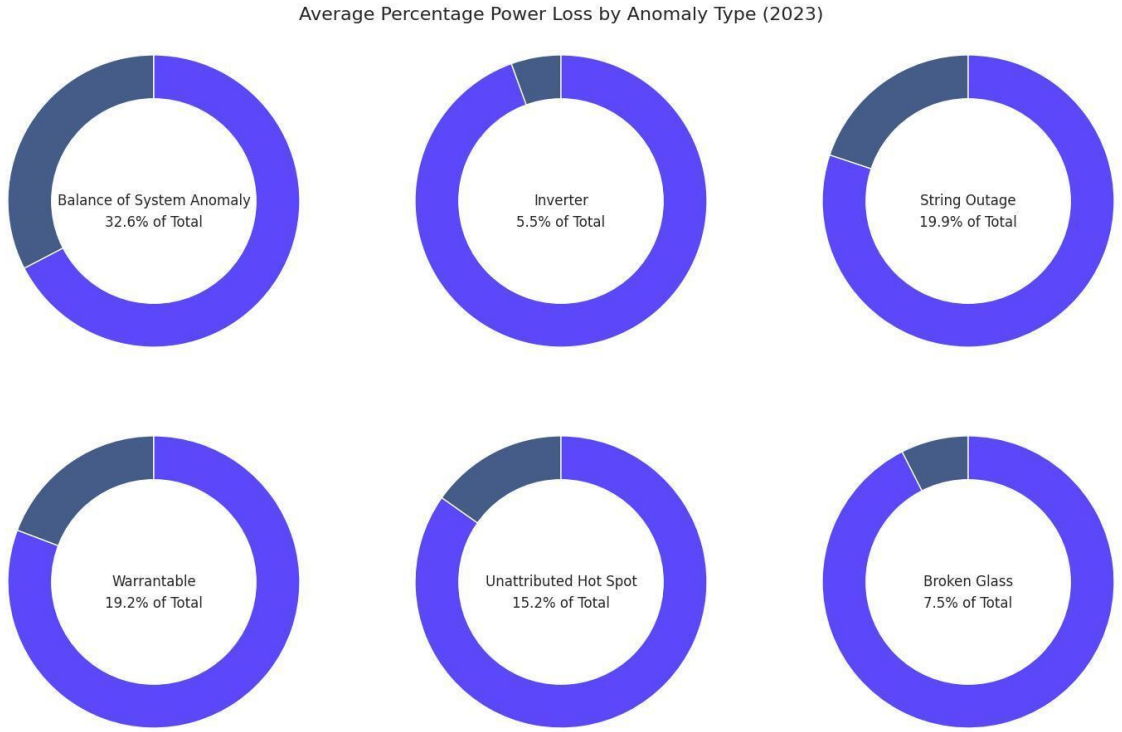
Anomalies and Analytics across 165 GW of Thermal Data



Airplanes or Drones?

Data Collection Considerations: Drone

Use Cases:

- Initial site surveys for mid or small-sized projects
- Pre-construction planning and bid optimization
- Construction progress tracking
- Verify construction and set performance baselines
- Semi-annual inspections of medium to small PV plants to track against baselines
- On-demand and spot check inspections
- Pre-sale or acquisition inspections

Maximum Coverage Area Per Day

- Up to 20 to 30 MW/day, 100 acres

Lead Time

- Standard lead time is 2 weeks, but Zeitview can often deploy within 48 hours
- Expedited and on-demand projects possible

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Data Collection Considerations: Full Scale Aircraft

Use Cases:

- Initial site surveys for a single or multiple large-scale projects
- Pre-construction planning and bid optimization
- Verify construction and set performance baselines
- Semi-annual inspections for a portfolio of facilities or plants spread across large geographies.
- Multiple large project sites in dispersed geographies
- Pre-sale or acquisition inspections

Maximum Coverage Area Per Day

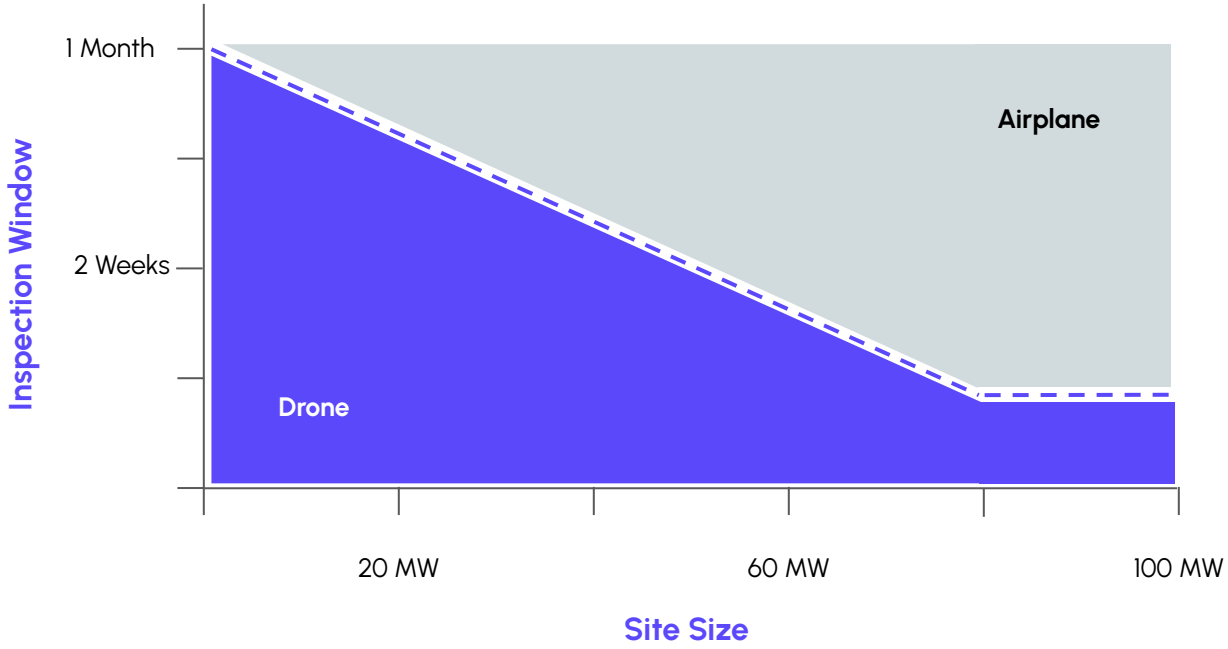
- up to 1.7 GW/day, 3,000 acres or as many as 100 rooftops

Lead Time

- Requires advance scheduling (2-4 weeks)
- Often scheduled in spring & fall
- May be performed on-demand depending on facility size and location.

So What Collection Methodology is Best for My Sites?

Site Size and Timing flexibility

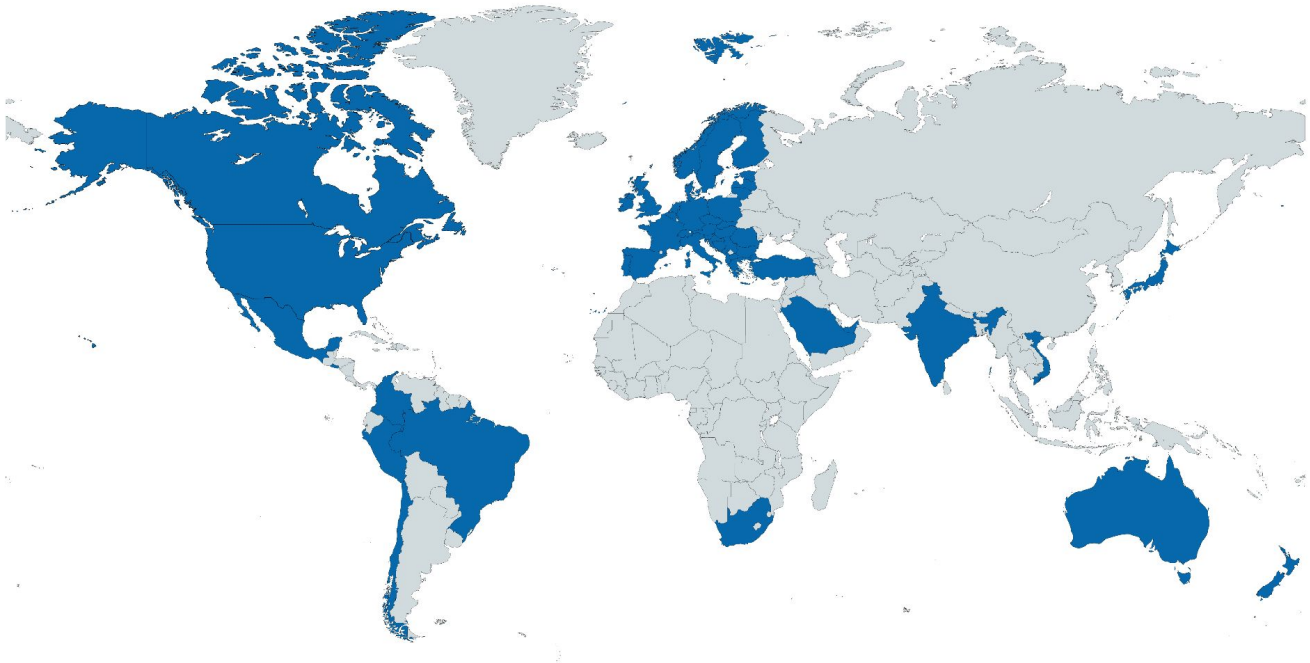


General rule of thumb: Reactive plane scans are possible and more economical for sites larger than 100 MW, smaller sites need some level of timing flexibility

Location - Market Coverage

Airplanes & Drones

Drone only



Preventative maintenance approach

Two main approaches we see operators and O&Ms implementing aerial inspections

Stepped approach

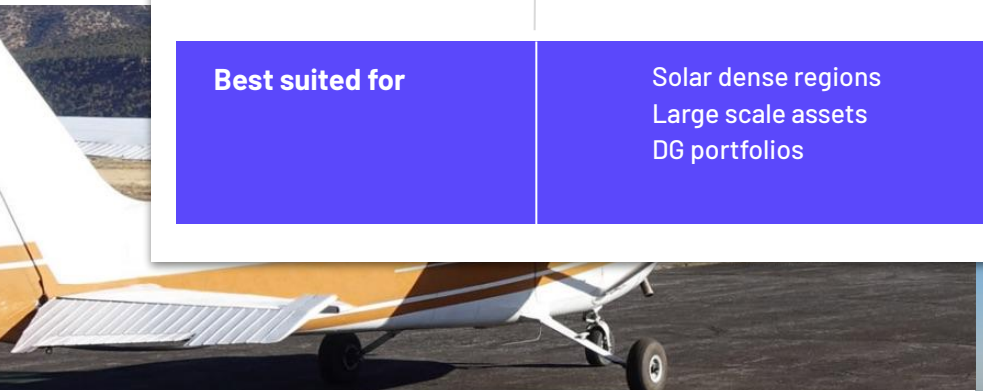
- Sites are scanned one at a time
- Often times after PM visit and module cleaning
- Urgent issues often require another mobilization to site
- Non-urgent corrective issues will be added to next site visit

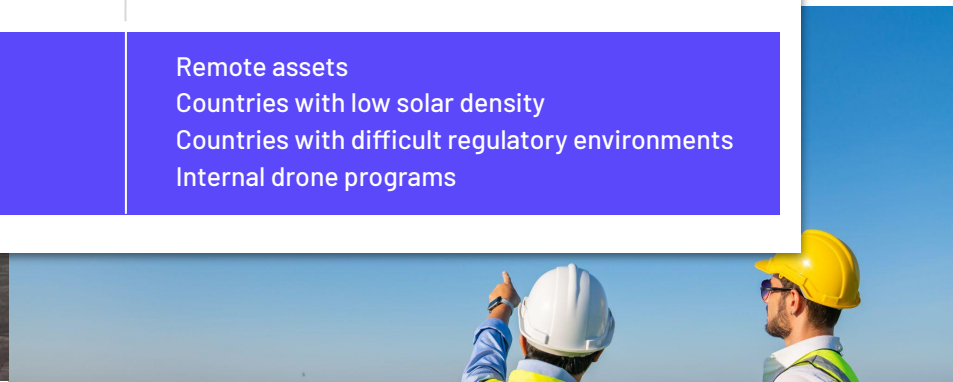
Full portfolio scans

- All sites are scanned as early as possible prior to peak production season and PM
- Corrective issues are added to PM
- Spare parts are procured on a portfolio level
- Level of soiling is often higher than in stepped approach

Using the Right Tool for Your Needs

Benefit	Piloted Aircraft	Drone
Consistency	High data consistency across sites and portfolios	Changes in day, irradiance, weather conditions, site performance may lead to less consistency
Convenience	Requires active coordination for deployment No onsite coordination or safety considerations, easier contracting	Can be deployed flexibly Allows for in-house data capture Often requires site access and field staff support
Data Capture Speed	Up to 200 MW/hour	Up to 5 MW/hour
Resolution	IR = 6.5cm RGB = 2cm higher resolution available	IR = 3cm / 5cm RGB = 1 - 3cm
Best suited for	Solar dense regions Large scale assets DG portfolios	Remote assets Countries with low solar density Countries with difficult regulatory environments Internal drone programs



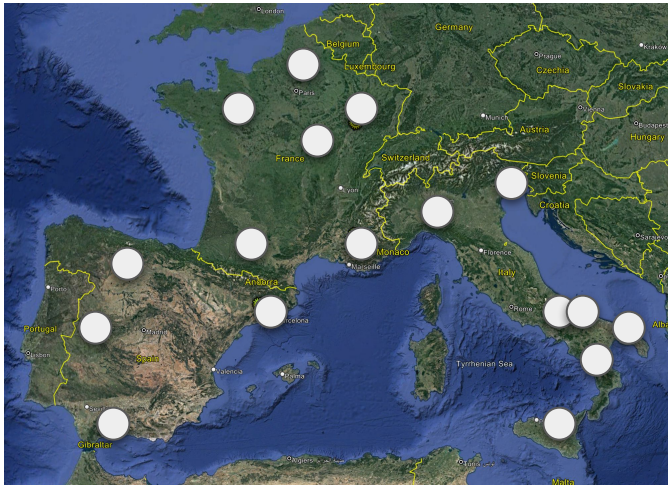


Examples

Scenario 1: Distributed & Low Density

Portfolio Characteristics:

- Plants are very distributed with low density
- Site sizes are between 0.5-50 MW
- Assets have to be scanned on specific days
- Spain, Italy, France, Australia and US



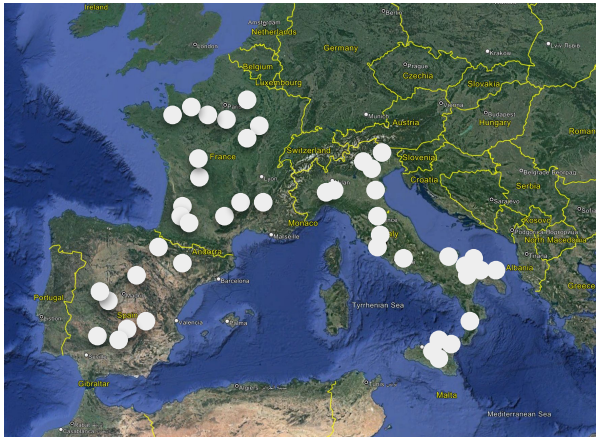
Recommendation:

For this portfolio we would recommend utilizing drones as the cost benefit would be between 5%-15%

Scenario 2: Larger & More Higher Density

Portfolio Characteristics:

- Plants are fairly concentrated (EU) or larger (Australia)
- Site sizes are between 0.5-300 MW
- Assets have to be scanned within a 4-week window
- Spain, Italy, France, Australia and US



Recommendation

For this portfolio we would recommend utilizing planes as the cost benefit would be between 15%-20%
Large volume pricing is available for single assets if added to country scan

2024 European Flight Routes

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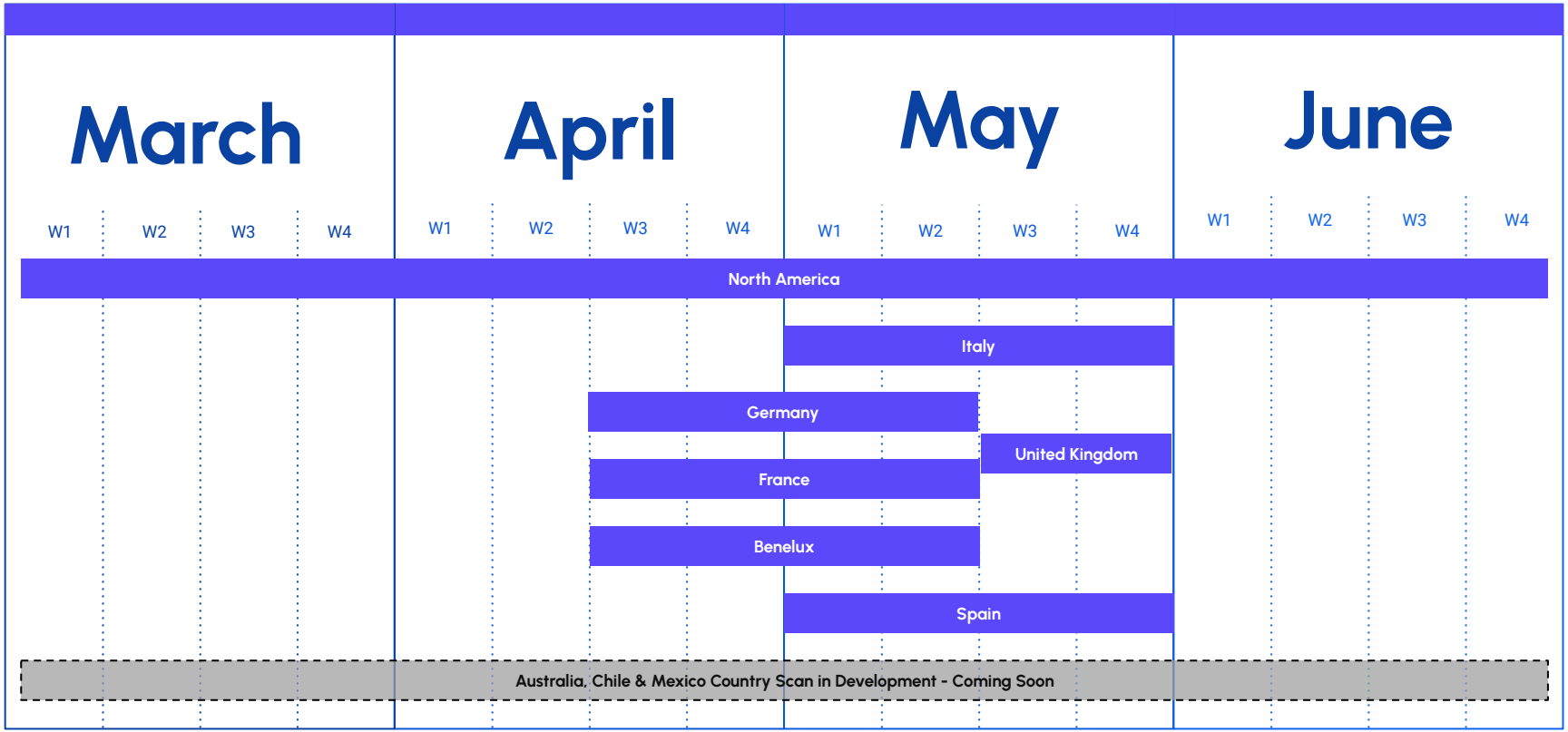
Spring 2024 Aircraft Flight Schedule



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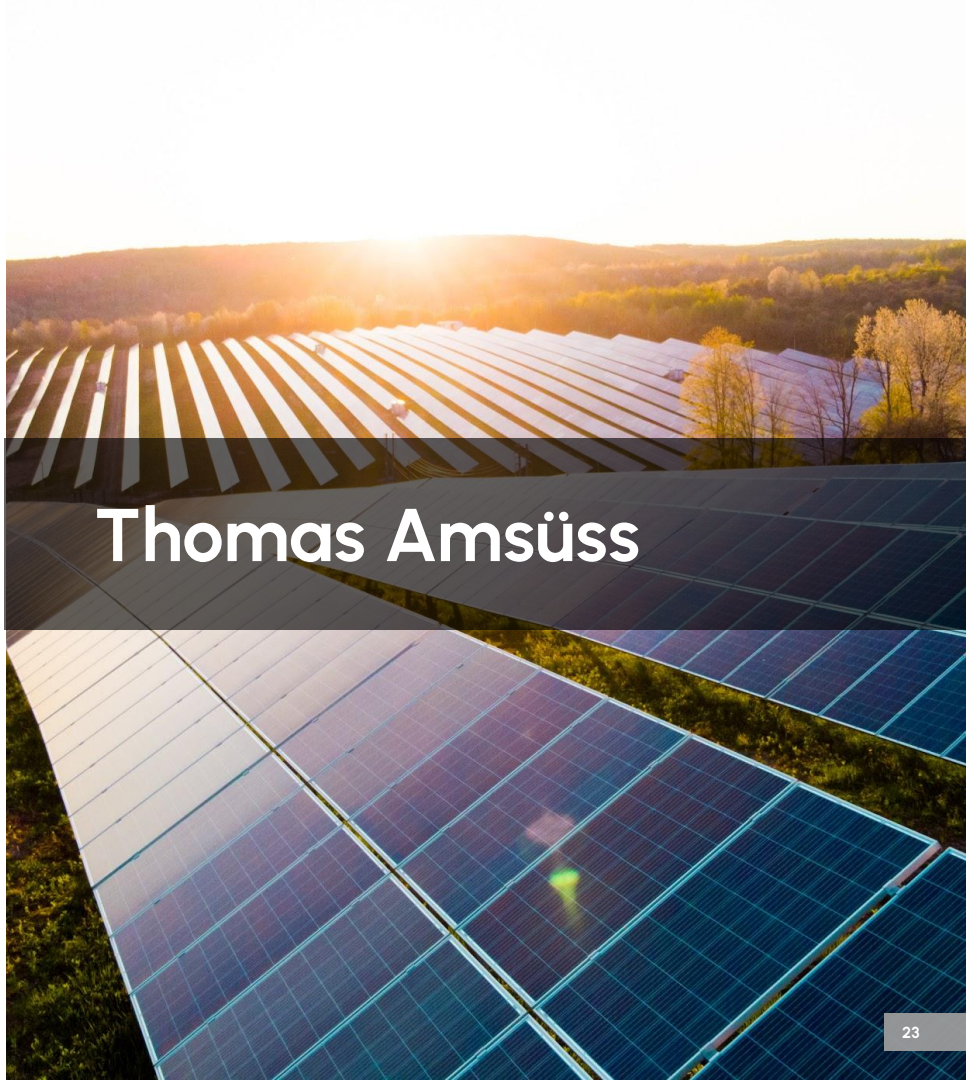

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Thank you for joining today!