



NO Water Mechanical Automated Dusting Devices

The latest on cleaning technologies

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About NOMADD



- 7 Years of Desert Dust Experience
- Longest Desert Operation Track Record
- All R&D Located in the Desert
- Deep Research Capability
- Solution Focussed



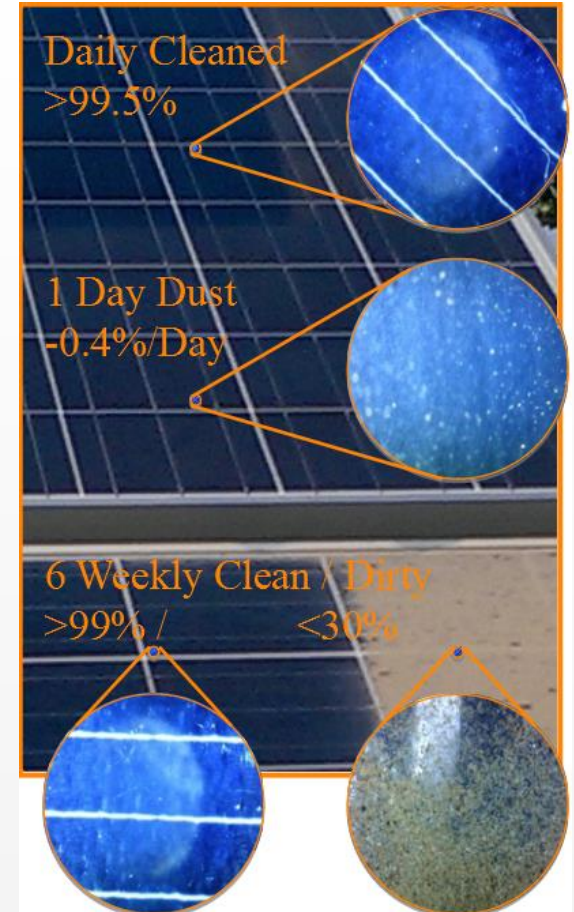
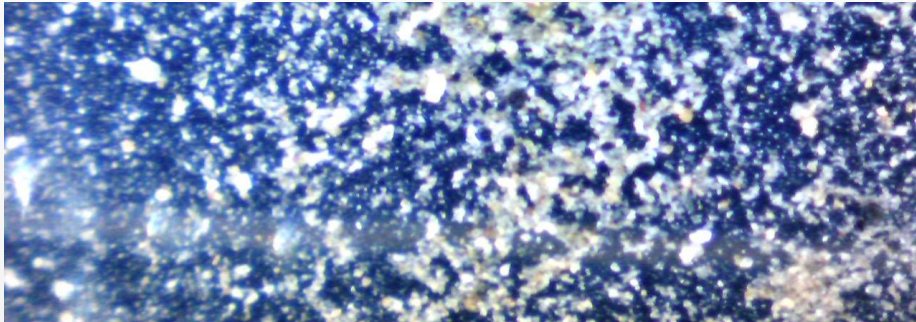
Presentation Overview

- Soiling Insights
- Measurement Insights
- Robot Fundamentals
- Robot Key Insights
- Future Robot Predictions
- Preparing For Success



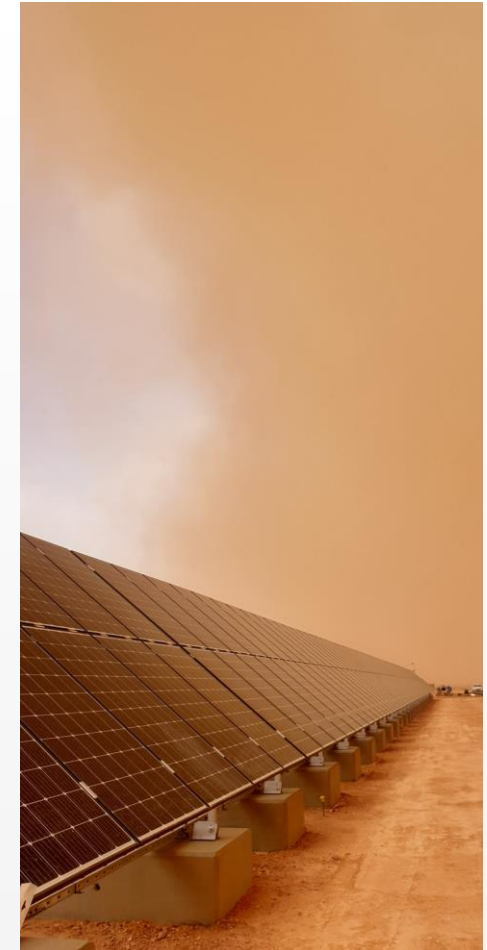
Soiling Insights

- 0.4 to 1.1% per DAY soiling losses
- Many Variables, Location Specific.
- Complex Interactions
- Very Hard to Lab-Replicate Humidity
- Very Hard to Model
- Don't Underestimate it!



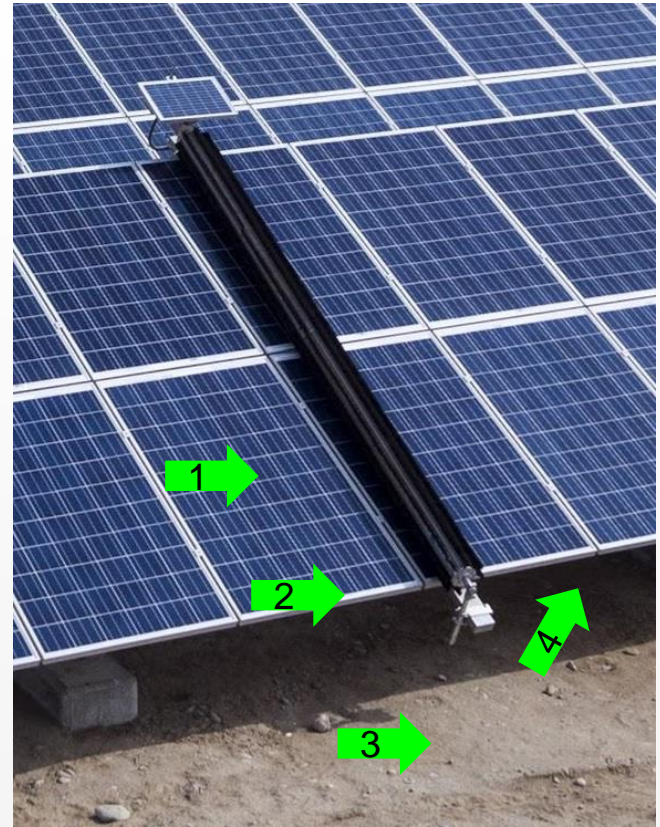
Measurement Insights

- Local Soiling Loss Measurement is a STRATEGIC INVESTMENT
- Challenge: Separate the Losses
 - What is from Soiling and What is Not?
- Multiple Methods Available
 - Inverter Level Comparisons
 - Small String and Electronic Load Comparisons
 - Light Scatter Sensors (In Development)
- Recommendation: Start Measuring ASAP



Robot Fundamentals

- The Key Difference: Where they LOAD
 - Panel Glass (1)
 - Panel Frames (2)
 - Ground (3)
 - Understructure (4)
- Different Load Points Affect Many Things.
 - Compatibility
 - Ease of Design
 - Dangers to the Panels



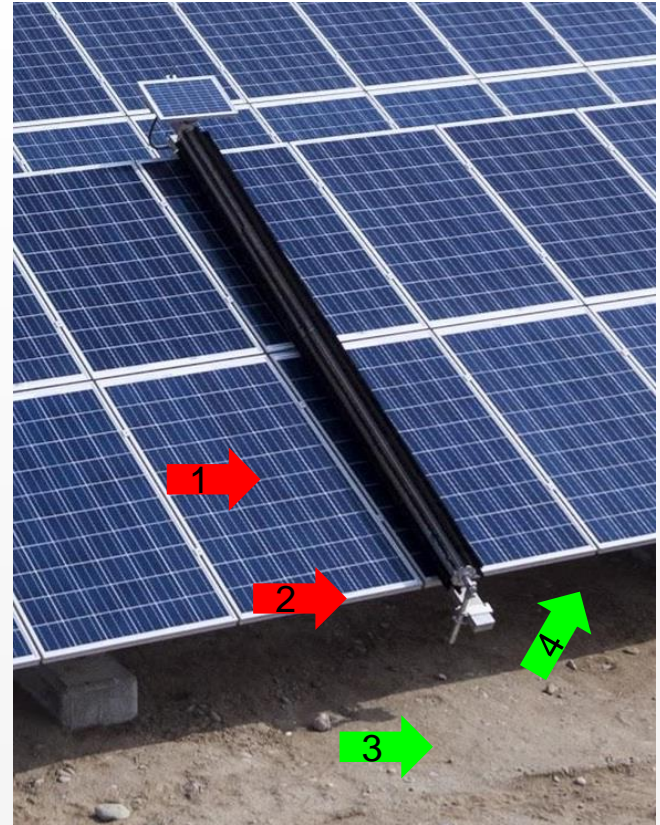
Robot Insight 1: Panels Don't Like Robots

- Cert. of Compliance \neq Cert. No Damage
- Dust grit plus robot load = Damage over Time
- Lab Conditions Don't Replicate This!
- Time Will Tell.
- Recommendations:
 - FIELD TEST
 - Reduce the Risk: Avoid Panel Loading
 - Microscope Analysis Reveals a LOT



Future Prediction 1

- Learning Curves Will Show Panel Damage
 - Edge Running Robots will likely discontinue
 - Glass Running Robots will likely discontinue
 - RFP's Starting to Reflect This
- Shift: Frameless Panels + Trackers
 - **Robots will be array integrated or ground mounted.**



Robot Insight 2: Robots Don't Like Deserts

- The Key Issue is Reliability: Many Systems Are Failing
 - Electronics (Rated and TESTED at Site)
 - Mechanical Complexity
 - Perishables (Plastic, Lubricant etc)
- Limited Desert Track Record At Scale to Date



Future Prediction 2:

- Quality Systems Only Will Survive
- Fewer Moving Parts
- Simplified Electromechanical
- **Deep Monitoring Capability**
- **Look for Integration**



Remember The Plant Owner's Question.

The Question is not How Often to Clean. The question is: How do I capture the biggest ROI?

- Start Measuring as Early as Possible
- Structure RFP's to Align Incentives
- Choose Low Impact, Desert Proven Technology
- Design Contracts to Incentivise long term mutual gains.

Future Prediction 3

- High Performance Robots + Accurate Measurement = Re-Imagineer the Cleaning Strategy

LOSSES	OLD DEAL	NEW DEAL
0%	Red bar (0-3%)	Red bar (0-1%)
1%		Green bar (1-2%) CLEANER BONUS
2%		Green bar (2-3%) OWNER BONUS
3%	Red bar (3-6%)	Red bar (3-6%)
4%		
5%		
6%		
	LOSE LOSE	WIN WIN

Summary: Prepare for Success

- Test Equipment Reliability AT SITE
- “Only the Desert is the Desert”
- Prioritize Panel Safety
- Optimise Plant Design
- Align Incentives of Stakeholders





Thank you

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