

PV Soiling Management

250 MW



The Challenge = \$1,176,188 loss due to PV soiling

Solar installation Size = 250 MW

Surface area to clean: 1,227,133.29 square meters with 1 cleaning per year

Surface area to clean: 2,454,266 square meters with 2 cleaning per year

No water on site



Goals

1. Save Money
2. Maximize performance
3. Clean with operational efficiency and without hassles
4. Know the value created
5. Know the KPI's to measure
6. Measure KPI's
7. **Maximize performance safely**

The Solution

Adopting NextGen PV soiling mitigation in the design phase for each site.

NextGen PV Soiling Mitigation

- A management framework that starts in the design phase



Solar O&M Department

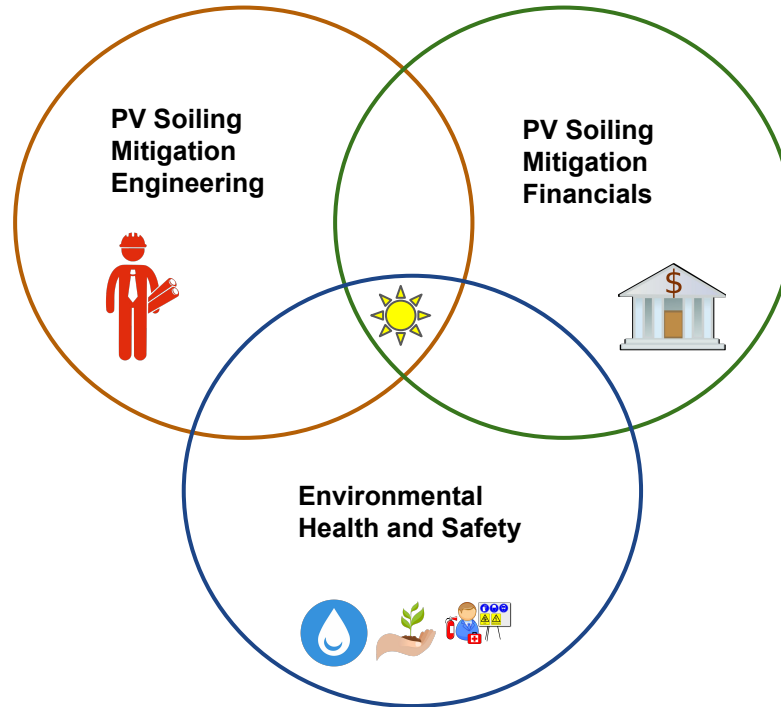
- Application of PV soiling management as a general practice

Solar Asset Owner

Optimized Economic Benefit + Risks Mitigated + Safety

How is this done?

NextGen PV Soiling Mitigation



Optimal PV Soiling mitigation is about **performance** and **safety**.

Obtain solar asset optimal performance safely

Get ready

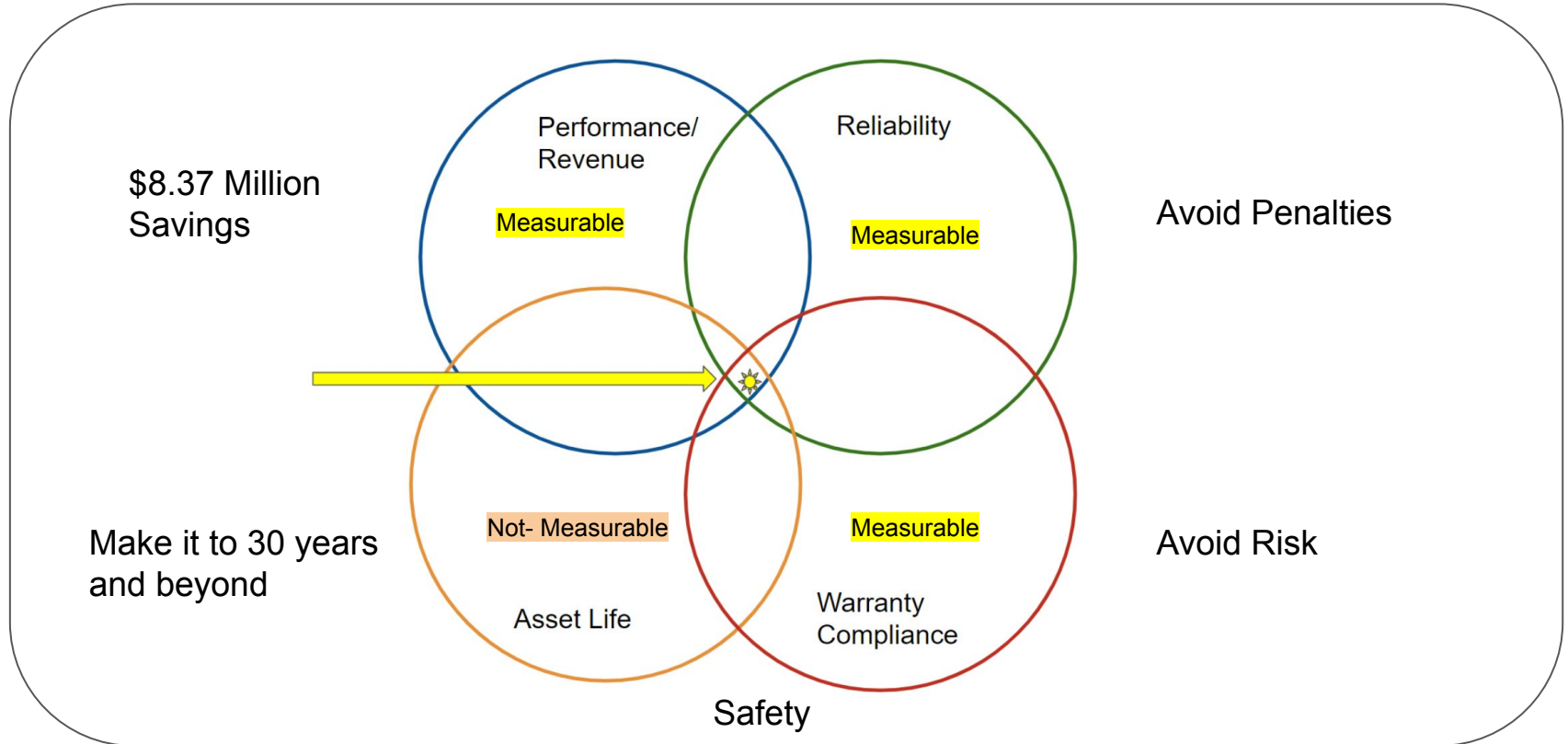


Does having a **site specific mindset** bring value?

	No PV Soiling Management	NextGen PV Soiling Management	30 Year Benefit
Revenue	\$41,062,500	\$41,062,500	
Cost of the Problem	\$1,176,188	\$702,221	
Cost of the Solution - CapEx	\$0	\$271,557	
Cost of the Solution - CapEx prorated over 30 years		\$9,052	
Cost of the Solution - Opex		\$185,660	
Savings	\$0	\$279,255	\$8,377,638
ROI (CapeX + Opex)	0.00%	61.08%	
Problem Cost / Revenue	2.86%	2.18%	
Cleaning Cost per MWh	????	\$779	
Threshold values		\$9,346	



Value



How is PV soiling being managed today?



Corrective Mindset Stage	Corrective Mindset Stage	Corrective Mindset Stage	Hybrid Mindset Stage	Preventative + Process Innovation Stage	Preventative + Process Innovation Stage
Apprentince Stage	Corrective Mindset Stage	Initial Tech Stage	Supplier Development	NextGen PV Soiling Mitigation 1.0	NextGen PV Soiling Mitigation 2.0

Build.. lose performance.. then discover the cause is PV soiling

Build.. lose performance, know the cause is PV soiling

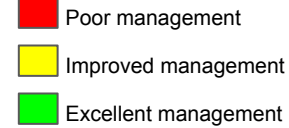
PV Monitor + Build...lose performance, know the amount

Supplier Valuation

PV Soiling Engineering + Financial Analysis + EHS

Application of NextGen Technologies

The Problems & Benefit at Each Stage



	Performance Risk Management	Financial Risk Management	Environmental Health and Safety Risk Management	Reliable Energy Risk Management	Quality Risk Management	Asset Case Management	Supply Chain Risk Management	Talent Risk Management	Warranty Compliance Risk Management	Innovation Risk Management
Apprentice Stage	Poor Performance	Poor Revenue	Poor operator safety	Poor energy reliability	Not meeting targets	Assets are at risk of being damaged	Operations are complicated and inefficient	Head of Cleaning needs to be developed and is scarce	Not following warranty guidelines	Not adopting new innovations makes us be less competitive
Corrective Mindset Stage	Poor Performance	Poor Revenue	Poor operator safety	Poor energy reliability	Not meeting targets	Assets are at risk of being damaged	Operations are complicated and inefficient	Head of Cleaning needs to be developed and is scarce	Not following warranty guidelines	Not adopting new innovations makes us be less competitive
Initial Tech Stage	Clear understanding of performance loss	Poor Revenue	Poor operator safety	Poor energy reliability	Better at hitting targets	Assets are at risk of being damaged	Operations are complicated and inefficient	Head of Cleaning needs to be developed and is scarce	Not following warranty guidelines	Not adopting new innovations makes us be less competitive
Supplier Development Stage	Clear understanding of performance loss	Poor Revenue	Poor operator safety	Poor energy reliability	Better at hitting targets	Assets are at risk of being damaged	Operations are complicated and inefficient	Head of Cleaning needs to be developed and is scarce	Not following warranty guidelines	Not adopting new innovations makes us be less competitive
NextGen PV soiling mitigation 1.0	Clear understanding of performance loss	Optimized Revenue	Operator safety guaranteed	Energy reliability accomplished	Targets accomplished	Assets are safe	Supplier Management accomplished	Complete Understanding	Following warranty guidelines & working with suppliers to update them	Not adopting new innovations makes us be less competitive
NextGen PV soiling mitigation 2.0	Clear understanding of performance loss	Optimized Revenue	Operator safety guaranteed	Energy reliability accomplished	Targets accomplished	Assets are safe	Supplier Management accomplished	Complete Understanding	Following warranty guidelines & working with suppliers to update them	Adoption of new technologies makes us highly competitive



Achieve optimal solar asset
performance **safely**