

# Municipal Solar Procurement

## Technical Considerations for Procurement and Installation



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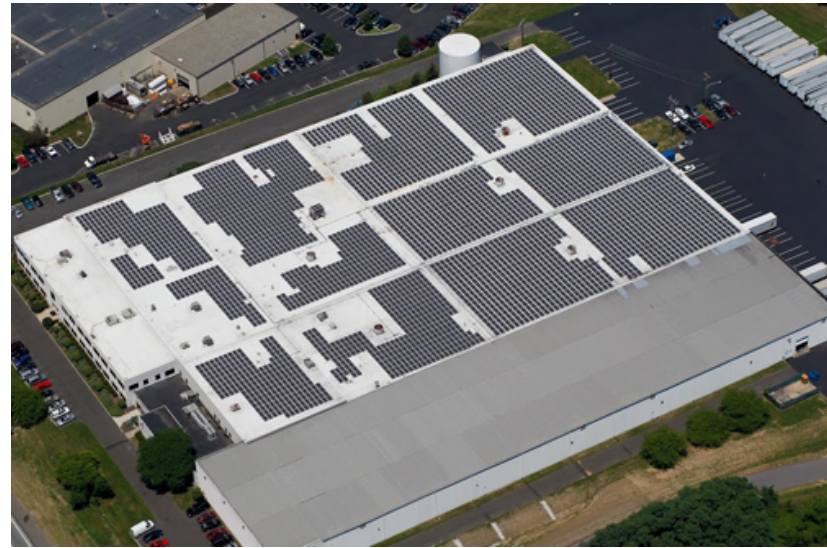
Senior Project Manager | OPTONY

Driving the National Capital Region Solar Market | November 17, 2014



# Agenda

- Solar 101
- Solar Procurement Checklist
- Procurement & Proposals
- Understanding Financing Options
- Overview of Installation Types
- Project Implementation
- Getting Started



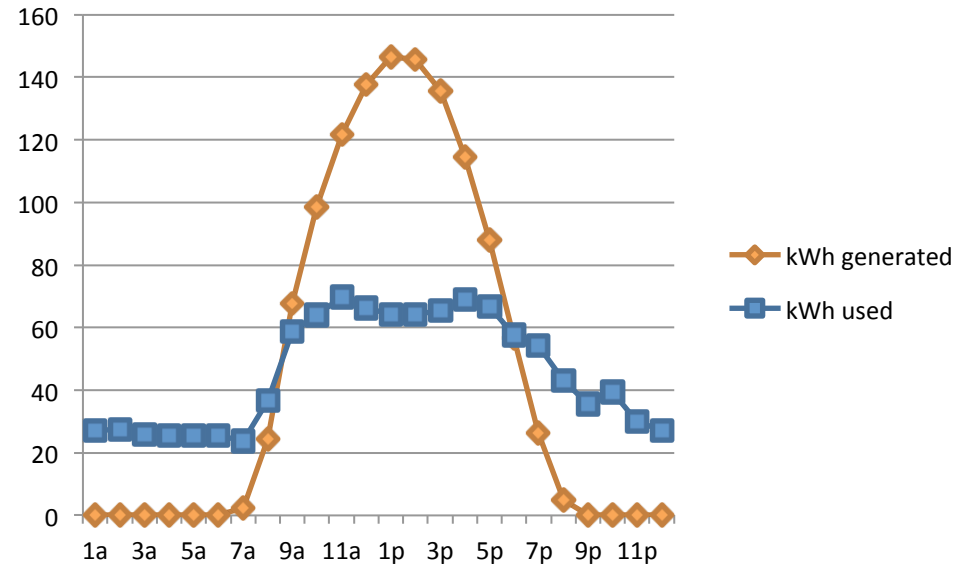
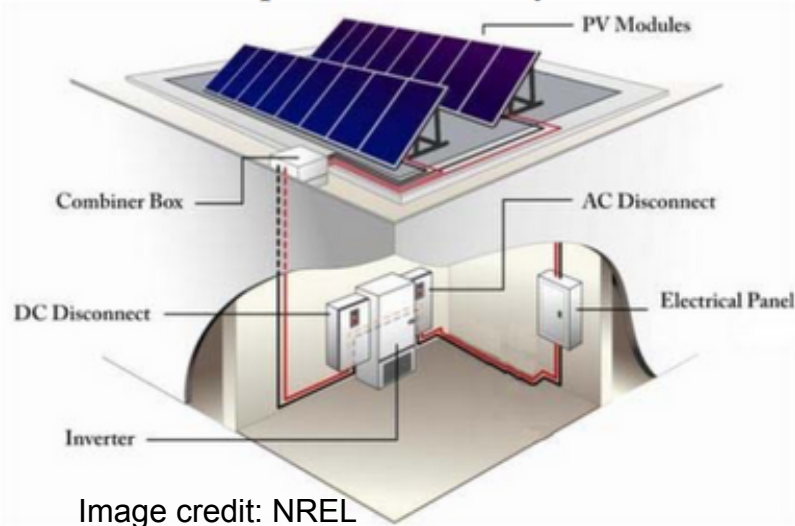


# Air quality impact during APEC meeting in Beijing



# Solar 101

## Components of a PV system



**Total energy generated: 1,171.86 kWh**  
**Total energy used: 1,092.61 kWh**





## Recent trends in the solar market

### Trend:

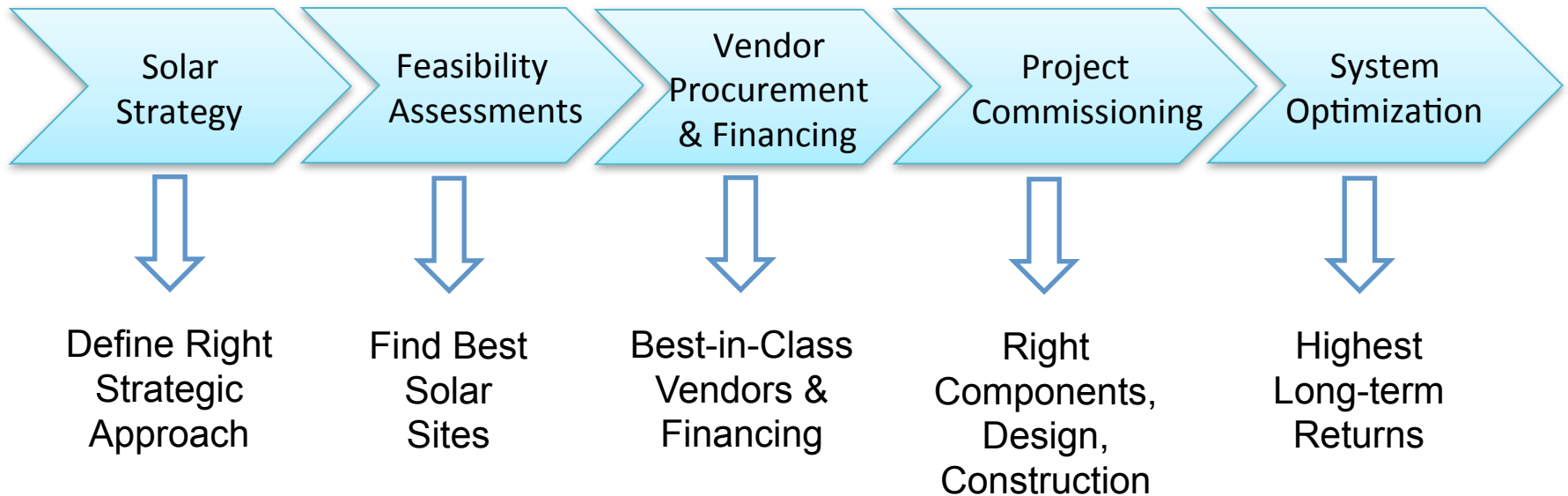
- Dramatic Drop In Panel Prices
- Consolidation In The Industry
- New Financial Players In The Market
- Maturing Industry
- Standardized Deployment Models
- Grid Parity Accelerating (without incentives)



### Impact:

- Better Project Economics
- Few, Stronger Players
- Lower Cost Of Capital
- Increased Competition
- Risk Reduction
- Mass Adoption Of Solar

## Solar Project Lifecycle Management



*Properly managing all phases of your project will create the greatest long-term value.*



# Solar Procurement Checklist

## Define Goals

- Total energy generation
- Carbon offset
- Project economics
  - Total savings vs. ROI vs. IRR
- Desired financing structure
- Visibility



## Challenges

- Competing operational priorities
- Limited staff time and resources
- Cross-departmental cooperation
- Internal procurement & legal requirements
- Net metering and PPA laws
- Lack of awareness of financial benefits
- Risk aversion
- Historic preservation

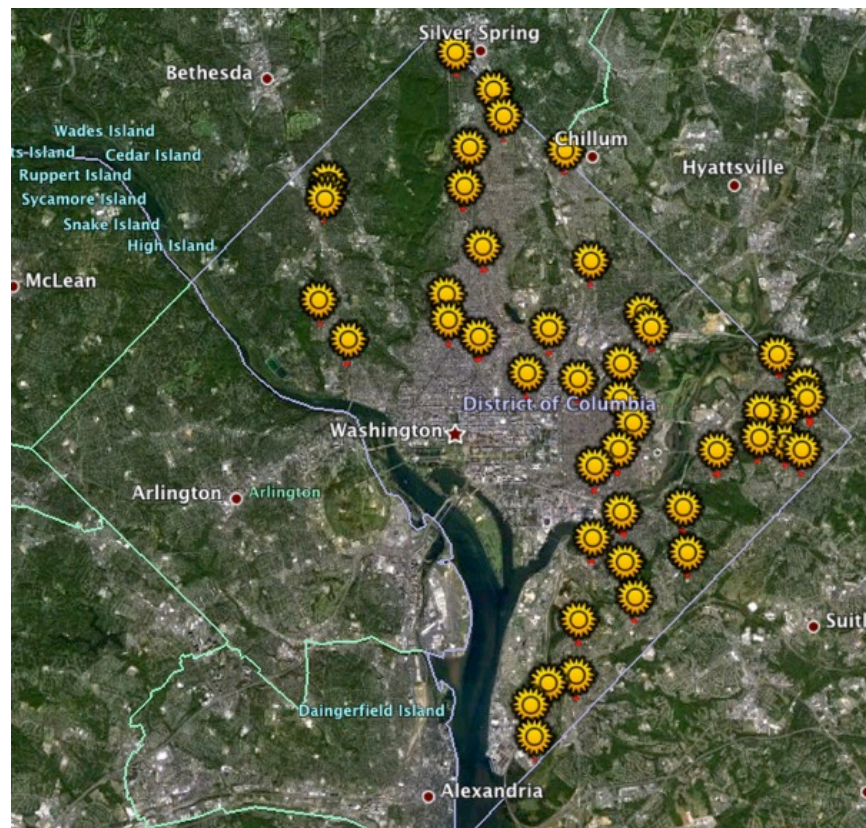
## Opportunities

- Large facilities and parking areas can make good sites
- Reduce monthly electricity costs
- Provide long-term budget certainty
- Multiple financing structures available
- Demonstrate community leadership
- Excellent open-source tools and resources available

# Solar Procurement Checklist

## Identifying Potential Sites

- Portfolio approach to site evaluation
- Review buildings, parking areas, parks, brownfields, available land
- Assess roof age, condition, and material
- Identify major shading issues
- Coordinate with planned building renovations
- Impact of deployment on operation schedules
- Confirm Pepco secondary network constraints
- Prescreen and remove unviable sites





# Solar Procurement Checklist



## Feasibility Assessments

- On-site survey
- Electrical & structural evaluation
- Site-specific design considerations
- Historical electricity use analysis
- Utility rate evaluation
- Review of incentive and funding options
- 20-year LCOE financial analysis
- Benchmark against current pricing trends
- Technical risk assessment

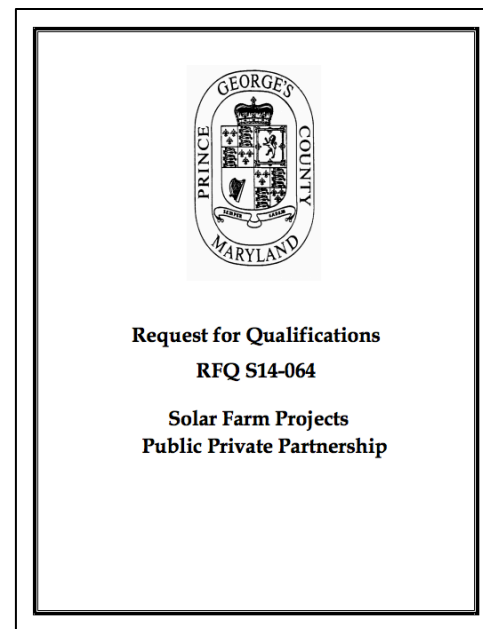
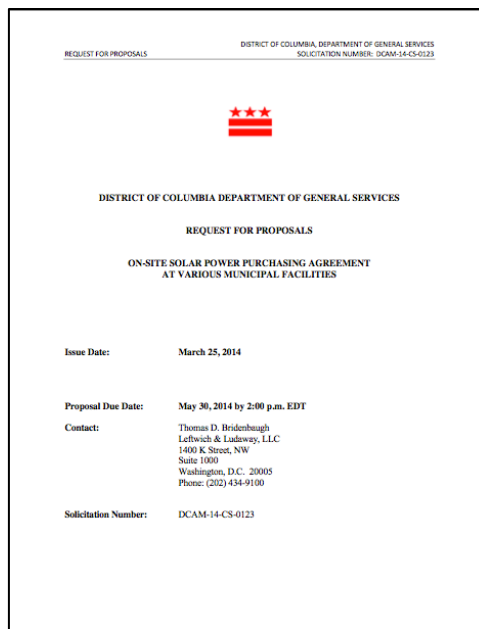
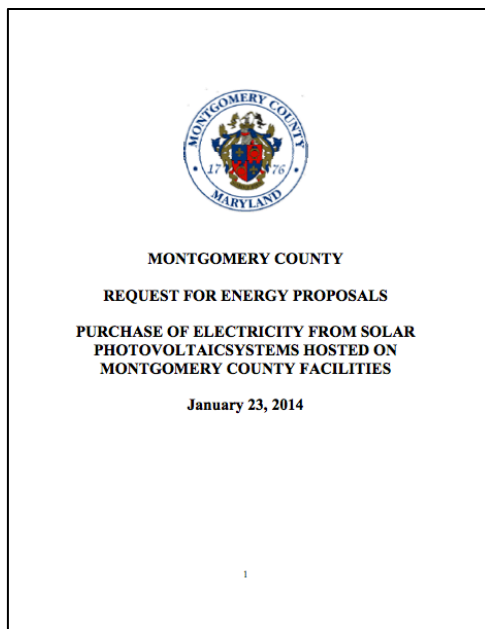
# Procurement & Proposals





# Request for Proposals

- Existing RFPs & RFQs in the region
- NREL contracts document library
  - <https://financere.nrel.gov/finance/content/renewable-energy-contracts-library>
- MWCOG rider



## Financing Choices Impact Project Design and Outcome

	<b>Direct Purchase</b>	<b>Third-Party Ownership</b>
<i>Key Elements</i>	<ul style="list-style-type: none"> <li>• Upfront purchase with cash reserves</li> <li>• Includes self-financing mechanisms: loans, bonds, PACE, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Power purchase agreement</li> <li>• ~ 20-year contract at fixed kWh rate</li> <li>• Performance guarantee may be included</li> </ul>
<i>Pros</i>	<ul style="list-style-type: none"> <li>• Attractive return on investment for customers with tax appetite</li> <li>• Free electricity for 25+ years</li> <li>• No additional financing costs, unless self-financing</li> </ul>	<ul style="list-style-type: none"> <li>• Eliminates upfront capital outlay</li> <li>• Lock in predictable electricity rates</li> <li>• Transfers O&amp;M responsibility to 3<sup>rd</sup>-party</li> <li>• Allows public entities and non-profits to access tax-related incentives</li> </ul>
<i>Cons</i>	<ul style="list-style-type: none"> <li>• Large upfront capital outlay</li> <li>• Responsible for O&amp;M, performance risk</li> <li>• Public entities and non-profits cannot access tax-related incentives</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated financing cost tends to be high</li> <li>• Potential complications in the event of change in ownership or occupancy</li> <li>• Third-party access to property is necessary</li> </ul>

\*Innovative finance models are evolving: green banks, community solar, and crowdfunding.

\*Federal investment tax credit to revert to 10%, standard depreciation at the end of 2016!

## Key Elements

- Financing options
- Pricing
- Savings and cash flow analysis
- Buyout % or cost; term options
- Template PPA/lease agreement
- Transparent modeling assumptions

## Considerations

- Buyer's financing options
- Incentive timelines
- Who owns SRECs? Term?
- How are SRECs valued? Realistic?
- Financial partner reputation

## Comparing Proposals

### Direct purchase price (\$/watt)

- ❑ Local/state/federal incentive value
- ❑ Utility escalation rate (2-5%)
- ❑ Savings/useful life term (20-30 years)
- ❑ Discount rate (3-6%)

### PPA price (\$/kWh)

- ❑ PPA escalation rate (2-5%)
- ❑ Utility escalation rate (2-5%)
- ❑ Savings/useful life term (20-30 years)
- ❑ Discount rate (3-6%)
- ❑ SREC value (\$X/MWh for X years)

### Levelized cost of energy (\$/kWh)

- ❑ Valuable metric for simple comparison over project lifetime



## Key Elements

- Energy output
- % energy/bill offset
- System design diagrams
- Proposed hardware
- Product spec sheets & warranties
- Transparent modeling assumptions

## Considerations

- Roof condition
- Hardware quality
- Policies affecting system size
  - Net metering limits
  - Meter aggregation eligibility
  - Interconnection rules

## Comparing Proposals

### System Design

- ❑ Size/capacity (kW DC vs. AC)
- ❑ Proposed hardware (panels, inverters, etc.)
- ❑ Tilt, azimuth, and shading
- ❑ Roof mounted or ballasted

### System Performance

- ❑ Energy production (kWh)
- ❑ Annual degradation rate
- ❑ Performance guarantee

## Key Elements

- Quote expiration date
- Template PPA/lease agreement
- Template site access agreement
- Letter from financial partner
- Recommendation letters

## Considerations

- Vendor qualifications: capabilities, experience, financial strength, reputation, etc.
- Ensure internal procurement and legal staff are involved and educated on details of solar project

## Comparing Proposals

### Warranties

- Hardware (~25 years)
- Labor (~ 10 years)

### O&M

- Included in price?
- What's included?
- Frequency

### Who handles the paperwork?

- Incentives
- Interconnection application
- Tax-related incentives



# Overview of Installation Types

- Rooftop
- Carport/Shade Structure
- Ground-mount





# Installation: Rooftop > Carport > Ground-Mount

- **Penetrating**
- Ballasted
- Standing-Seam
- Laminate Thin Film





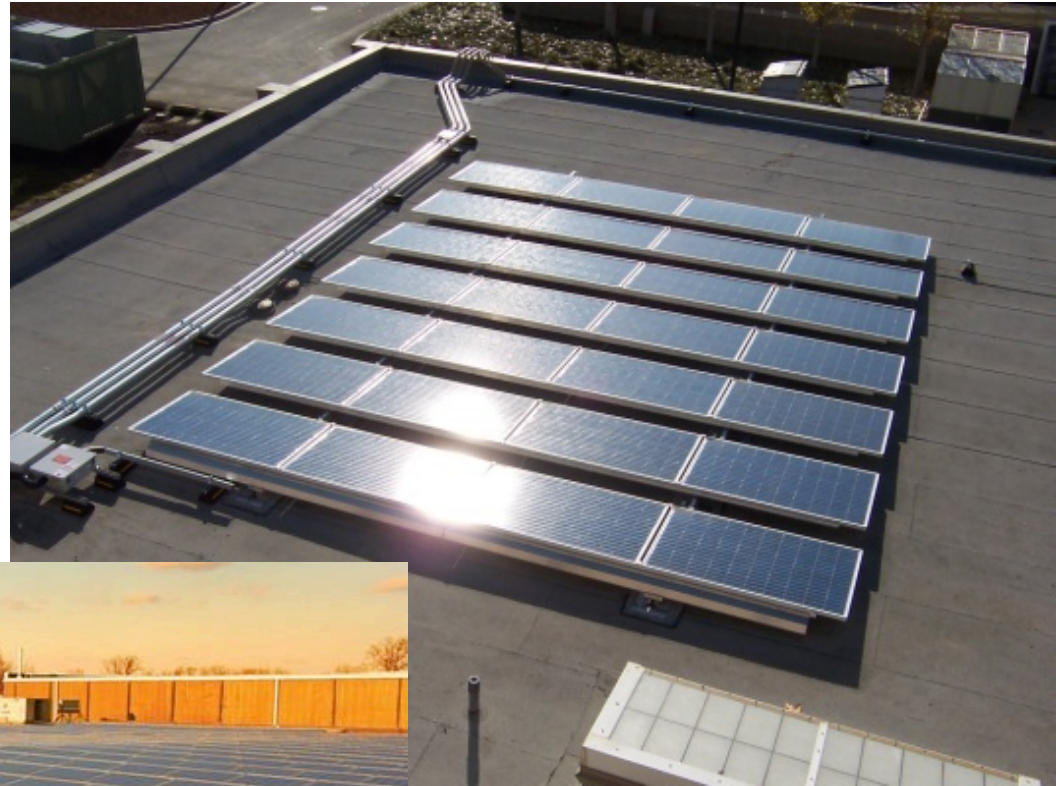
Installation: **Rooftop** > Carport > Ground-Mount

## Example: Flush Mount Installation



# Installation: Rooftop > Carport > Ground-Mount

- Penetrating
- **Ballasted**
- Standing-Seam
- Laminate Thin Film





Installation: **Rooftop** > Carport > Ground-Mount

Example: Low-Tilt, Ballasted Racking System





Installation: **Rooftop** > Carport > Ground-Mount

Example: High-Tilt, Ballasted Racking System





# Installation: Rooftop > Carport > Ground-Mount

- Penetrating
- Ballasted
- **Standing-Seam**
- Laminate Thin Film





# Installation: Rooftop > Carport > Ground-Mount

- Penetrating
- Ballasted
- Standing-Seam
- **Laminate Thin film**





# Installation: Rooftop > Carport > Ground-Mount

- Carport
- Shade Canopy





# Installation: Rooftop > Carport > Ground-Mount

- Carport
- Shade Canopy





# Installation: Rooftop > Carport > Ground-Mount

- Carport
- **Shade Canopy**





# Installation: Rooftop > Carport > Ground-Mount

## Example: Fixed Tilt Shade Structures – Bus Parking





# Installation: Rooftop > Carport > Ground-Mount





# Installation: Floating



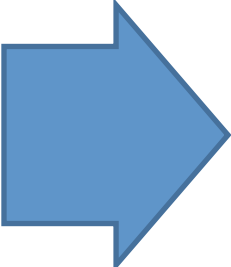


# Project Implementation

- Project Management & Commissioning
- Operations & Maintenance



# Project Management & Commissioning

- Contract and scope review
  - Design and engineering review
  - Materials acceptance
  - Permitting
  - Rebates and interconnection application
  - Schedule and operational impacts
  - Crew safety and accessibility
  - Line locating
  - Special inspections
  - Drilling/trenching/boring
  - Interconnection and shut-down
  - Aesthetic issues
  - Inspection and PTO
  - As-Builts and staff training
  - Data connection, monitoring, kiosk
  - Independent performance verification
- 
- Production and component requirements
  - System sizing; code compliance
  - Stainless, galvanized, painted, Al, fiberglass
  - Building, Planning, Fire
  - DSIRE & Pepco/Dominion
  - Planning
  - Focus and logistics
  - SAFETY
  - Underground, welding, concrete, roof
  - Operational impacts
  - Operational impacts
  - Paint, design, trim
  - Building Dept and Pepco/Dominion
  - String charts, emergency operations
  - Internet monitoring and public access
  - Confirm expected performance



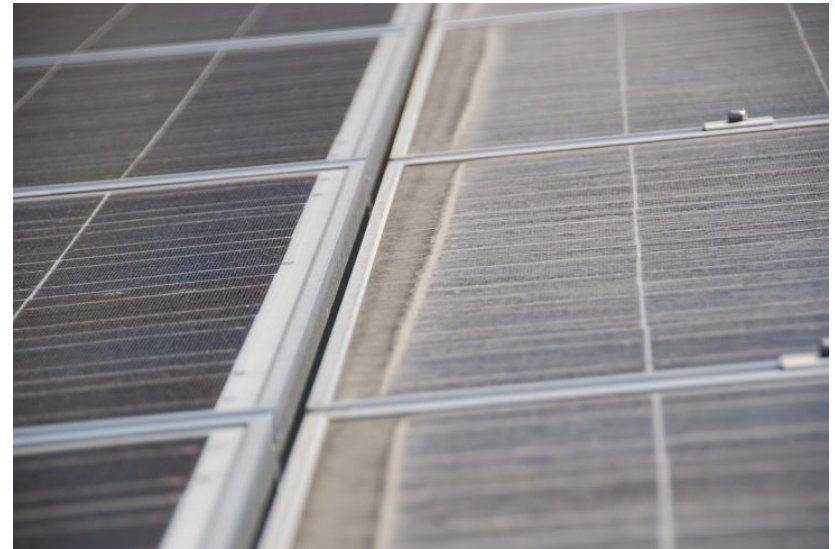
# Operations & Maintenance

## Performance Management

- Monitoring
  - On-site irradiance and power measurements
  - On-line system monitoring
- Purchase or Lease
  - Self-perform
  - Installer or 3rd-party O&M provider
- Power Purchase Agreement
  - Owner/installer

## Cleaning & Inspection

- Module cleaning
- Inverter cleaning
- Fuse and wiring check



# Getting Started

1. Identify project lead and convene stakeholders
2. Define goals and identify potential roadblocks
3. Identify, prescreen, and assess potential sites
4. Develop and issue an RFP
5. Evaluate and compare vendor proposals
6. Interviews vendors with most compelling proposals
7. Select best vendor & negotiate contracts
8. Manage project implementation
9. Commission the systems



# Key Resources

## Talk to Experienced Peers

## Talk to Local Solar Installers

### NREL

- Renewable energy contracts library
- PVWatts

### DOE

- SunShot Initiative resource center

### EPA

- Green Power Partnership
- State & Local Climate & Energy Program

### DSIRE Database

- Up-to-date incentive information
- Comprehensive policy information

### Optony

- Purchasing Power: Best Practice Guide
- SolarRoadmap.com



# THANK YOU!

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# About Optony

Optony develops and deploys solar best practices across the entire solar project lifecycle for government agencies, schools, investors and commercial organizations.

Working with clients across all phases of solar projects creates deep insight into true performance drivers which is used to reduce costs and improve performance at any stage in the process.

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*“Optony's consulting service is a must-have for any organization considering an investment in solar. Based on Optony's comprehensive analysis and recommendations, we now have a low-risk, high-return solar strategy.”*

