SEED Fund

Collaborative Solar Procurement for Public Agencies

Solar Project Installation and Technical Considerations

August 2015
Agenda

• Introductions
• SEED Fund Overview
• Overview of Technology and Installation Types
• Feasibility Assessments and Design Considerations
• Project Management and Commissioning
• Operations and Maintenance
• Next Steps
About SEI

Strategic Energy Innovations is committed to actions that sustain our planet. We’re a certified green business, community-based nonprofit organization

*Committed to empowering under-served markets*
- Schools, colleges and universities
- Local governments
- Small and rural communities
- Affordable housing providers and residents
- Small businesses

*…to embrace a climate-friendly future through green building, clean energy, resource efficiency and support of a local and qualified green workforce.*
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.

www.optony.com

“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.”
Goals of SEED Fund

• Use State funding to develop collaborative solar procurement for government agencies in the Monterey Bay Area
• Bring at least 5 MW of new public renewable energy on line
• Realize 10-12% in total project cost savings
• Reduce transaction costs and administrative effort by 50-70%
• Deliver collaboration support for 1.5-2% of total contracted solar project costs – NO upfront costs to participants
• Secure agreements to build collaboration costs into solar contracts
• Create significant new economic activity and jobs
• Leverage regional initiatives for education and workforce development
• Attract additional funding for long-term sustainability of the fund
Silicon Valley Regional Solar Project Overview

Includes 43 sites
- Collaboration across 9 jurisdictions
- 14.4MW of combined solar PV

Multiple Site Types:
- Carports
- Rooftops
- Ground mounted

Largest multi-agency effort to date
- County of Santa Clara
- 6 Cities
- 2 Special Districts

LESSONS:
Aggregated purchase discounts 12%+
Reduced admin and transactions costs 50%+
Better negotiated contract terms & conditions
Program Timeline

**High-level review of potential sites for solar development**
- Q2 ‘15

**Site feasibility assessments**
- Q3 ‘15

**Decision 1:**
Review potential for solar development and sign MOU to proceed with viable projects

**Issuance of RFP**
- Q4 ‘15

**Decision 2:**
Final decision about economic and environmental benefits of solar installation for your facilities

**Evaluation of vendor responses and negotiation of contract terms**
- Q1 ‘16

**Council/Board approval of projects and start of design activities**
- Q2 ‘16

**Project construction begins!**
- Q3 ‘16
Recent updates:

Feasibility assessments received:
- San Juan Bautista
- Cabrillo College

Feasibility reports underway:
- Soledad

Site visits planned:
- North County Rec and Park
- Santa Cruz County

News:
- Technical workshop next month to discuss project types and design and construction considerations
## Major Changes in the Solar Industry

### Recent Changes

- Dramatic Drop In Panel Prices
- Consolidation In The Industry
- New Financial Players In The Market
- Maturing Industry
- US Markets Are The New Focus
- Excess PV Capacity Coming Online
- Grid Parity Accelerating (without incentives)

### Major Impact On:

- Better Project Economics
- Few, Stronger Players
- Lower Cost Of Capital
- Better Results For Clients
- Increased Competition
- Must Seek Long-Term Stability
- Mass Adoption Of Solar
Overview: Solar Energy Technology Examples

Solar Photovoltaic (PV) Panels/Modules

Solar Hot Water

Utility Scale Concentrated Solar Farm
How Solar Works: Grid-Tied System

Components of a PV system
(from the NREL’s Solar Ready Buildings)

Total energy generated: 1,171.86 kWh
Total energy used: 1,092.61 kWh
Review of Installation Types

• Rooftop
  – Penetrating
  – Ballasted (Hybrid)
  – Standing-Seam
  – Laminate

• Carport/Shade Structure
  – Fixed-tilt
  – Tracking

• Ground-mount
  – Fixed-tilt
  – Tracking

• Floating

• Building-Integrated PV (BIPV)
Installation Examples

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  - Penetrating
  - Ballasted
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- **Ground-mount**
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- **Floating**
- **Building-Integrated PV (BIPV)**
Example: Flush Mount Installation
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Example: Low-Tilt, Ballasted Racking System
Example: High-Tilt, Ballasted Racking System
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Solar Project Lifecycle Management

- Solar Strategy
  - Define Right Strategic Approach
- Feasibility Assessments
  - Find Best Solar Sites
- Vendor Procurement & Financing
  - Best-in-Class Vendors & Financing
- Project Commissioning
  - Right Components, Design, Construction
- System Optimization
  - Highest Long-term Returns

Properly managing all phases of the project will create the greatest long-term value
Solar Site Feasibility Checklist

- Portfolio approach to site evaluation
- On-site survey
- Structural & Electrical evaluation
- Construction concerns and design considerations
- Utility rate evaluation
- Review of funding and incentive options
- 20 year LCOE Financial analysis
- Benchmark comparison of pricing & trends
- Technical risk assessment
- World-class tools & methods
Design Considerations: Rooftop

Considerations:
• Building structural capacity
• Site-use planning
• Parcel ownership
• Building orientation
• Shading from trees, buildings, power lines
• Accessibility
• Roof type
• Rafter spacing and type
• HVAC or other rooftop obstacles
• Location of interconnection points
• Damage or theft hazards

Opportunities and Constraints:
• Weight loading; wind loading; seismic
• Move or stop operations; re-purpose
• Lease term? Usable? Able to interconnect?
• South-facing = good; north = not so good
• Shade kills solar production
• Expense of construction; operational impact
• Penetrations or ballasted; re-sealing
• Weight loading; anchor point locations
• Parapets? Required walkpads?
• Electrical, data
• Baseball fields? Copper swap meet?

Benefits: Use of available space; often hidden from view; more economical; close to interconnection point; typically more secure areas.
Design Considerations: Carports

Considerations:
- Site-use planning
- Parcel ownership
- Parking lot orientation
- Shading from trees, buildings, power lines
- Accessibility
- Soils report
- Obstacles
- Structure type
- Location of interconnection points
- Aesthetics
- Additional uses
- Damage or theft hazards

Opportunities and Constraints:
- Move or stop operations; re-purpose
- Usable? Able to interconnect?
- South-facing = good; north = not so good
- Shade kills solar production
- Vehicle heights; operational impact
- Water table; rock
- Trees; light poles; grass/bio-swales; utility lines
- Fixed-tilt; tracking; “blanket”
- Electrical, data; trenching
- Paint; structure; trim
- Shade; rain-proof?; truck wash; lighting
- Baseball fields? Copper swap meet?

Benefits: Use of available space; secondary goals; high-visibility “green” project; often close to interconnection point.
Design Considerations: Ground-Mounts

Considerations:
- Site-use planning
- Parcel ownership
- Slope orientation
- Shading from trees, buildings, power lines
- Accessibility
- Soils report
- Obstacles
- Structure type
- Location of interconnection points
- Damage or theft hazards
- Extra maintenance

Opportunities and Constraints:
- Move or stop operations; re-purpose; CEQA
- Usable? Able to interconnect?; setbacks
- South-facing = good; north = not so good
- Shade kills solar production
- Roads, slope
- Water table; rock; brownfield?
- Trees; grass/bio-swales; protected areas
- Fixed-tilt (ballasted, drilled, driven); tracking
- Electrical, data; trenching
- Baseball fields? Copper swap meet?
- Weed abatement; dirty locations

Benefits: Use of available space (brownfields); typically low visual-impact areas; more economical; greater viability of tracker systems.
Project Management & Commissioning

- Contract and scope review
- Design and engineering review
- CEQA compliance
- 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
- Categorical Exemptions, Mitigated Neg Dec
- Stainless, galvanized, painted, Al, fiberglass
- Building, Planning, Fire
- PG&E (no more CSI)
- Planning
- Focus and logistics
- SAFETY
- Underground, welding, concrete, roof
- Operational impacts
- Operational impacts
- Paint, design, trim
- Building Dept and PG&E
- String charts, emergency operations
- Internet monitoring and public access
- Confirm expected performance
Operations & Maintenance Issues

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
Next Steps

• Provide information for potential sites
• If you haven’t already, sign MOU
• Review report recommendations and discuss participation in the RFP
• Build internal understanding and consensus
• Send follow-up questions to SEED team:
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  – Karly Zimmerman  karly@seiinc.org  415-507-1430
  – Tom Skawski  thomas.skawski@optonyusa.com  773-332-8815