



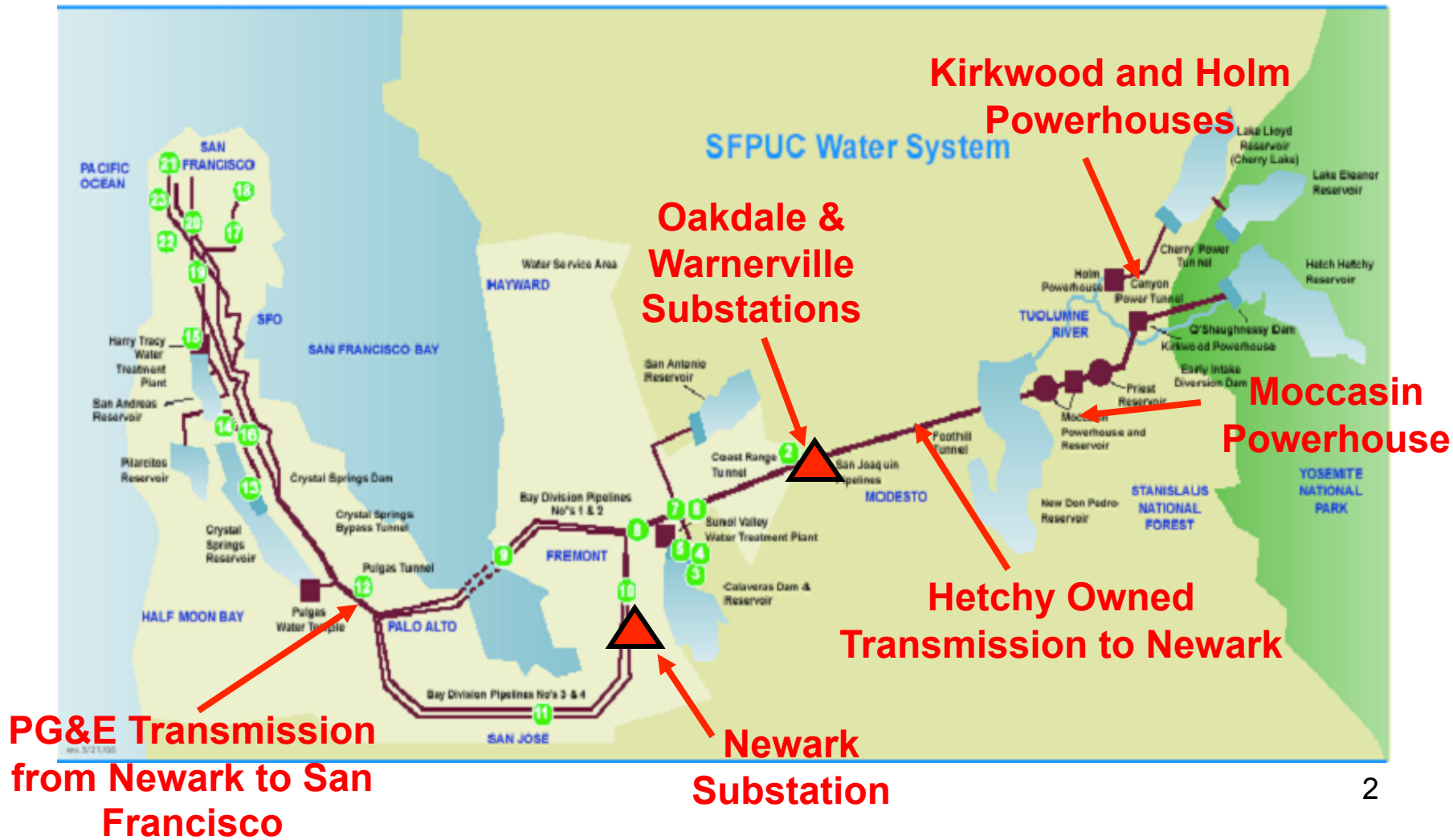
SAN FRANCISCO PUBLIC UTILITIES COMMISSION ENERGY GENERATION GROUP

March 12, 2007

**City of Brisbane Baylands Project
Solar Alternatives**



Hetchy Generation & Transmission System



WHY RENEWABLE ENERGY

- Decreases GHG (greenhouse gas) emissions - reduces global warming
- Offsets use of non-renewable power
- Reduces dependency on foreign oil
- Reduces exposure to volatility of oil and natural gas prices

RENEWABLE ENERGY – STATE LEGISLATION

- **SB1078 and SB1038 (year 2002)** - 2% per year increase in renewables beginning in 2003 to reach at least 20% by end of 2010; goal of 33% by end of 2020
- Applies to IOUs, ESPs and CCAs; MUNIs implement themselves
- Eligible renewable resources solar thermal, PV, wind, geothermal, fuel cells using digester gas, small hydro (<30 MW), digester gas, landfill gas, ocean wave, ocean thermal, tidal current.
- Governor accelerated goal to 33% of statewide power supply with renewables by 2020

AB32 GLOBAL WARMING SOLUTIONS ACT

- **AB32 (yr 2006)** codifies the state's goal by requiring that state's global warming emissions be reduced to 1990 levels by 2020
- **AB32** requires that California Air Resources Board (CARB) develop appropriate regulations to report, monitor and discipline the process

SAN FRANCISCO POLICY GOALS AND OBJECTIVES

- SF Mayor's Executive Directive 05-107:
Rooftops for Municipal Solar
 - **City commitment to increasing the pace of municipal solar development**
- Mayor's Clean Energy, Clean Air Policy
 - **All city government's power to come from clean, renewable sources by 2010**

SAN FRANCISCO POLICY GOALS AND OBJECTIVES

- **SF Electricity Resource Plan (2002)**
 - **CCSF to reduce GHGs by 20% below 1990 levels by 2012**
 - **CCSF to install 28 MW of solar (municipal, residential and commercial) by 2008**
- **CCA Goals (per 2006 analysis)**
 - **CCA supplier to site, construct, operate, and maintain:**
 - **107 MW of in-city Energy Efficiency**
 - **31 MW of in-city photovoltaic generation**
 - **72 MW of other in-city distributed generation**
 - **150 MW of wind generation capacity located outside SF**

MOTIVATION FOR SOLAR PROJECT DEVELOPMENT BY SFPUC

- Mayor, SF Board of Supervisors and voters strong support for solar project deployment
- Prop B rev bonds approved by voters in 2001 provides \$100 million for city govt solar projects
- Prop H rev bonds approved by voters in 2001 provides unlimited funding for all solar projects
- SFPUC goals to provide 100% renewable public power to Hunter's Point
- SFPUC recently issued RFI to solicit proposals on City/Private solar partnerships

SOLAR INDUSTRY STATUS

- Industry is exceptionally strong
- Shortage of raw silicon to make panels
- Short supply of panels and high prices
- Short supply of qualified installers
- Shortages of silicon expected to ease in the next two years

SFPUC – COMPLETED PV PROJECTS

Moscone Center

675 kWp

OnLine March 2004



Southeast Plant

255kWp

OnLine October 2005







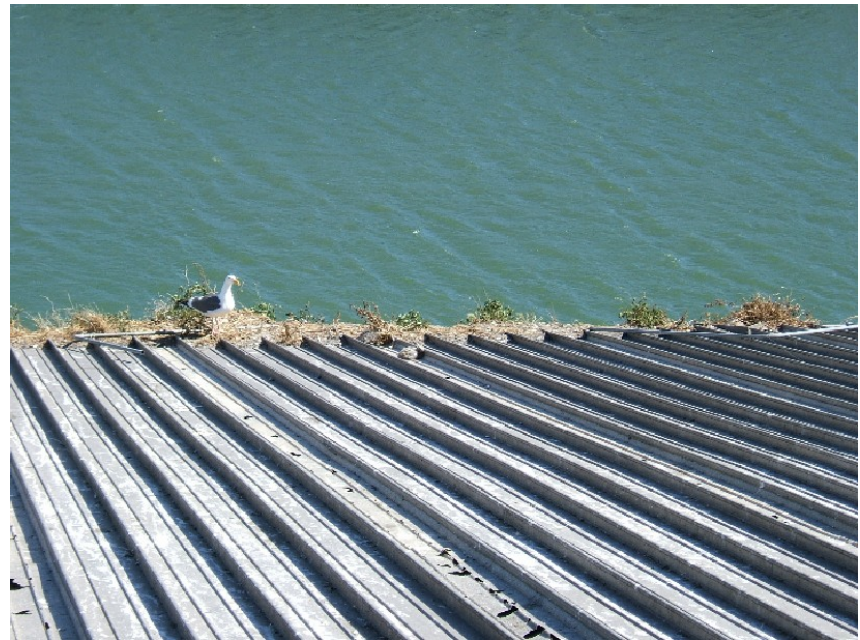
SFPUC - COMPLETED SOLAR PROJECTS

Pier 96 Norcal – 245 kWp
OnLine Dec 2006



Pier 96 Solar Photovoltaic Project Construction Update

- Construction halted June 8th until mid August due to Western Gull nesting activity



Pier 96 Solar Photovoltaic Project Construction Update

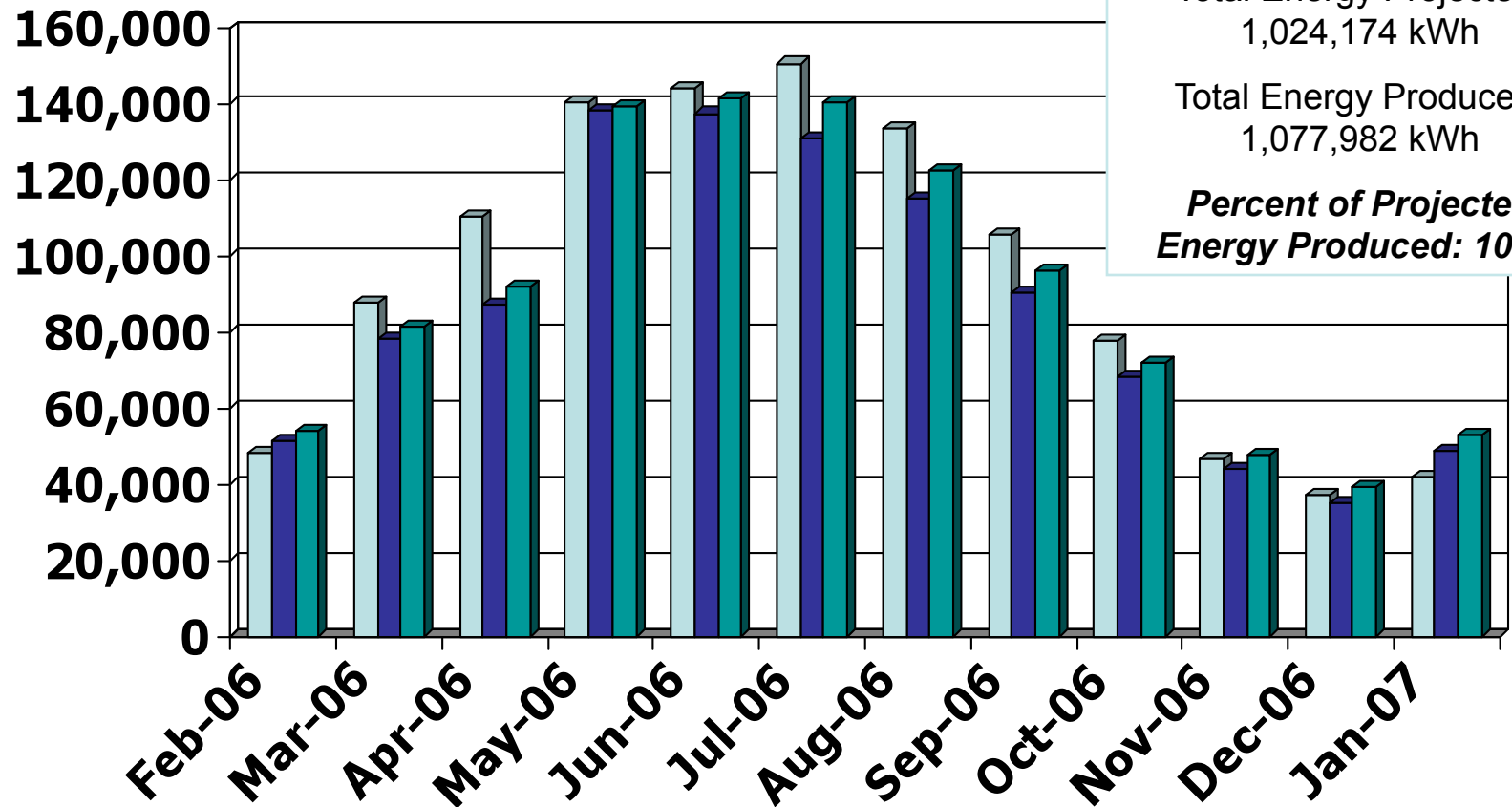
- After construction was halted, asbestos and PCB was found in the roofing material
- Abatement of roof started on September 18, 2006



Pier 96 Solar Photovoltaic Project Construction Complete



PUC PV Fleet Energy Performance (931 kWp) February 2006 – January 2007



Typical Year Energy Projection
 Energy Projected This Year
 Actual Energy Produced This Year

PROJECTS IN CONSTRUCTION

	Contract Award	In-Service
• Maxine Hall (30kW)	4th Qtr. 06	3rd Qtr 07
• ChinatownLib(10kW)	4th Qtr. 06	3rd Qtr 07
• CDD (100 kW)	4th Qtr. 06	4th Qtr 07
• SFO (500 kW)	1sr Qtr. 07	4th Qtr 07
• NorthPoint (245 kW)	4th Qtr. 06	4th Qtr 07

FUTURE RENEWABLE PROJECTS

- 15 year energy renewable plan being developed to assess:
 - Future load requirements to be served by SFPUC
 - Identify renewable projects and green market purchases needed to supply SFPUC load forecasts

SOLAR DEVELOPMENT STRATEGY

- New housing, commercial, industrial developments should be required by State and local codes to incorporate best economic energy efficiency, solar thermal, and solar photovoltaic as an integral part of the building structure
- Lennar homes announced that solar would be incorporated as a standard feature in new Bay Area homes
- SFPUC to incorporate solar and wind into design for new 525 Golden Gate HQ building

SOLAR DEVELOPMENT STRATEGY

- **Private developers can obtain 30% federal tax credit; accelerated federal and state depreciation at least until end of 2008- will probably be extended**
- **PG&E customers eligible for Performance Based Incentive rebate (systems greater than 100 kW)**
- **PG&E customers eligible for lump sum payment of \$2.50/watt for systems less than 100 kW**
- **To take advantage of the tax credit SFPUC is investigating issuance of a Power Purchase Agreement RFP for large size solar systems**
- **Proposal must meet specified power cost goals**
- **Use of public/private partnerships (recent RFI)**

SUPPLY OPTIONS

Solar Photovoltaic

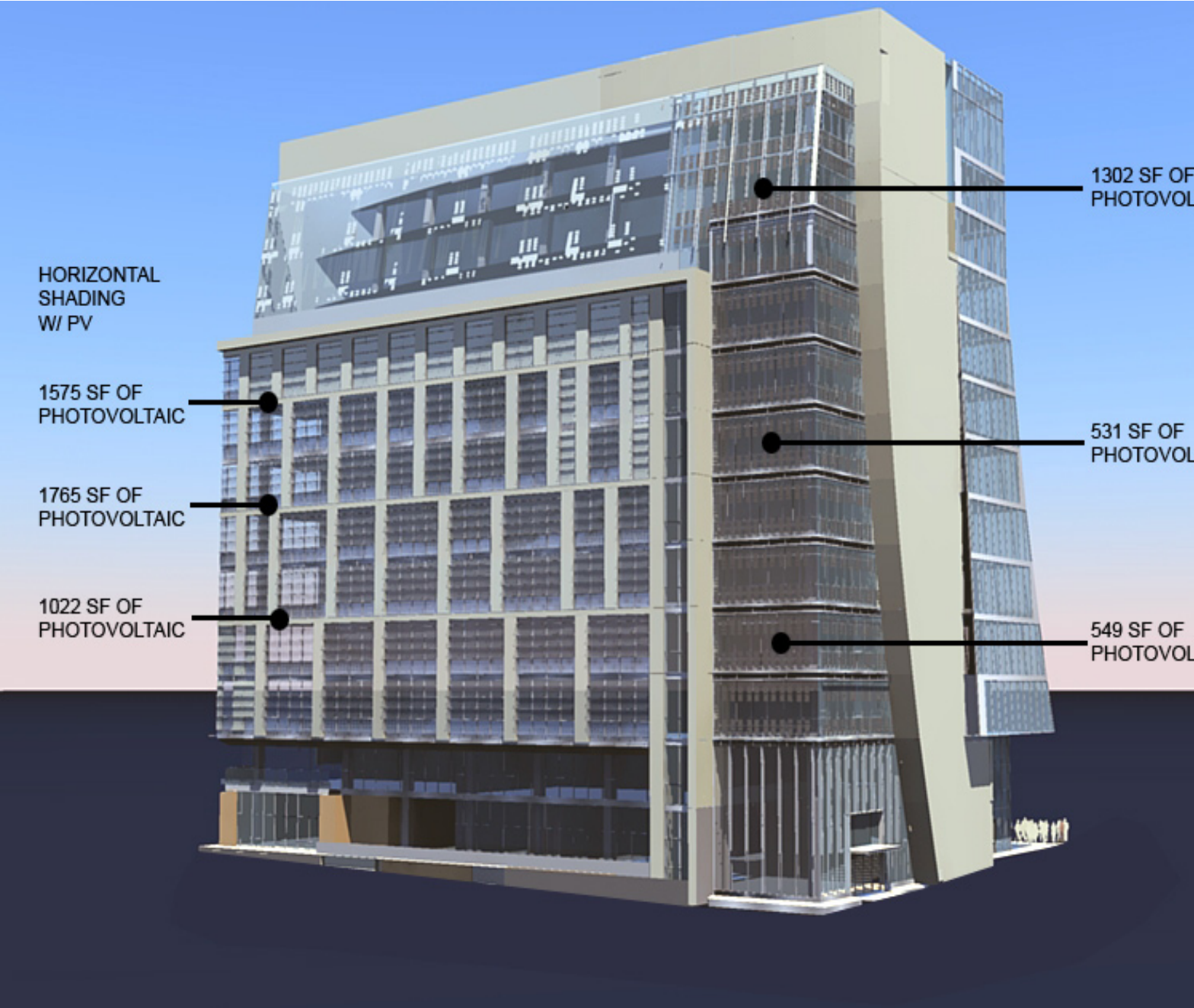
- **SFPUC Municipal facilities**
 - **Reservoirs 15.3 MW**
 - **MUNI 0.5 MW**
 - **Schools, hospitals, libraries etc.**
 - **Port 1 MW**
 - **SFO 1 MW+**
 - **Other Municipal properties**

SUPPLY OPTIONS

SFPUC Reservoirs and Water Treatment

Tesla	5.5 MW
Sunset	2.7 MW
Sutro Heights	1.6 MW
Univ Mound	1.3 MW
Pulgas	1.8 MW
Stanford Hts	1.0 MW
Merced Manor	0.8 MW
Summit	0.6 MW
TOTAL	15.3 MW

EXAMPLES OF SOLAR APPLICATIONS



Arnstein, Germany – 12 MW







Walldürn, Germany – 8.0 kW

Santa Barbara, Calif. - 12.6 kW





LESSONS LEARNED FROM SFPUC'S PROJECTS

KEY ISSUES

- **Capital project costs too high (\$7,000 to 12,000/kWp- without rebate) for design-build retrofit contracts - supply shortages driving up costs**
- **Limited bids received**
- **Limited project financing**
- **Lengthy city permitting process**
- **Lengthy city contracting process**
- **Interconnection issues**

OBSTACLES TO SOLAR DEVELOPMENT AND APPROACHES

Obstacle – High solar power costs

- **\$7,000/kWp to over \$12,000/kWp for design-build retrofit projects (without rebate)**

Approaches

- **SFPUC objective is to catalyze solar industry in SF using current technology and costs through city projects. SFPUC will also try new technologies**
- **Longer term, the expectation is that advanced PV technologies such as mass-produced thin-film will lead to lower and competitive costs.**
- **Purchase power through a Power Purchase Agreement where private developer gets tax and rebate incentives**
- **New projects should have lower costs - economies of purchasing and installation**

OBSTACLES TO SOLAR DEVELOPMENT AND APPROACHES

Obstacle - Project Financing

- **Revenue bonds (Props B and H) must be repaid from project revenue which may not be possible for high cost solar projects**

Approach to date

- **Projects to date funded through Mayor's Energy Conservation Account (MECA) which is derived from SFPUC Power Enterprise net revenue**
- **Host city departments pay same rate for solar power for a rooftop system as they pay for their normal power from SFPUC and hence are indifferent to solar economics**

OBSTACLES TO SOLAR DEVELOPMENT AND APPROACHES

Obstacle – Limited MECA Financing and lack of rebates

- **MECA funding may not be available to fund future projects due to other needs**

Approach

- **Future projects may be funded through Clean Renewable Energy Bonds (CREBS) zero interest federal government subsidized financing**
- **A Power Purchase Agreement (PPA) approach is being investigated where the private owner can take advantage of the 30% federal tax credit; accel depr, and other available subsidies**
- **SFPUC does not get PG&E SGIP rebates for Hetchy customers. PPA approach will also help because of tax incentives**

OBSTACLES TO SOLAR DEVELOPMENT AND APPROACHES

Obstacle – Lengthy City Contracting Process

Municipal contracting process is typically more complex and requires more time than private companies

Approach

Process can be made more efficient through standardization of:

- Memoranda of Understanding between City Departments**
- RFP contract documents and related specifications**
- Interconnection agreements**
- Standard offer to City Departments**

Contract time has been reduced by:

- Internal CEQA process**

OBSTACLES TO SOLAR DEVELOPMENT AND APPROACHES

Obstacle – Panel Shortages

- **Due to silicon shortages, panels of desired quality and efficiency are in short supply**

Approach

- **Seek suppliers through the RFP process that have access to panels with reasonable delivery times, and with the desired specifications**
- **Shortages expected to ease with more production of silicon supply**
- **Costs can be reduced through economies of purchasing and installation (new developments)**

OBSTACLES TO SOLAR DEVELOPMENT AND APPROACHES

Obstacle – Lengthy City Permitting Process

- **Typical permits required include CEQA, Dept of Building Inspection, Port, Airport, Arts Commission**

Approach

- **CEQA process has been internally streamlined**
- **DBI process is expedited by making the Dept familiar with new solar concepts and designs as early as possible prior to the receipt of bids**
- **Close contact and coordination with other City departments and outside entities such as FAA (airport) so as not to impede the RFP and contract process**

OBSTACLES TO SOLAR DEVELOPMENT AND APPROACHES

Obstacle - Project Development Staff Resources

- **The project development process involves analysis of roofs, orientation, shading, age, condition, structural load bearing, electrical load profiles, interconnection issues to assess the viability of specific solar projects**

Approach

- **Mayor has directed city departments to advise SFPUC of roof space for solar in their departments**
- **Consultants engaged through professional services contracts are used to supplement the normal internal staff resources to more efficiently develop multiple projects in parallel.**

Interconnection and Power Export

- **AB594 allows for electricity to be exported to PG&E for a credit, provided that over a one year period there is no more energy exported to PG&E than is consumed at the facility.**
- **AB2573 has passed the legislature and allows CCSF to export excess solar photovoltaic power at one location in exchange for receiving power from PG&E at an alternative municipal load location**
- **SFPUC would normally interconnect with PG&E under standard Rule 21 interconnection agreements**

CONCLUSIONS

- Solar photovoltaic, solar thermal and energy efficiency best incorporated into building design from outset
- Opportunities at Baylands exist for on-site solar plus additional solar for export
- Solar ground-mounted systems also feasible to incorporate into project design