



U.S. Department of Housing and Urban Development

# New Foundations for Community Efficiency: Solar Financing

**HUD Energy Conference –  
Chapman University College**

**June 17, 2009**

# Assessing Solar Feasibility

- **System and Installation Costs**
- **Utility Costs**
  - ***Weighted electricity costs***
    - Tariff rates, Time of use, Tiered schedule
  - ***Inflation trends***
- **Access to Financial Incentives**
  - ***Solar Rebates***
  - ***Federal Solar Investment Tax Credits***
  - ***Renewable Energy Credits (RECs)***
  - ***Accelerated Depreciation***

# Securing Solar Financing

- ***Long-term fixed financing***
- ***Local Governmental Programs***
  - California AB 811-type programs
  - Solar Cities
- ***Power Purchase Agreements***
- ***Improvement Loans***
  - HUD Section 241 Supplemental Loan Program
  - Utility Programs (*e.g. America Pays*)
  - **SAFE-BIDCO** (*State Assistance Fund for Enterprise, Business and Industrial Development Corporation*)

# Section 241 (a) Supplemental Loan

- **Eligibility:**

- Properties both HUD-assisted and HUD-Insured
- Provided financing for property repairs, improvements and alterations, and equipment purchases without refinancing

- **Objectives:**

- Keep project competitive; Extend economic life

- **Underwriting Considerations:**

- Supplemental Loan limited to 90% of estimated cost of proposed improvement
- Improvement + outstanding indebtedness cannot exceed maximum mortgage insurable
- Amortization period not to exceed remaining term on first mortgage

# Analyzing Transaction Costs and Cash Flow

- **Assembling Incentives and Rebates reachable under financing approach**
- **Modeling Generation and Utility Savings**
- **Estimating Coverage**
- **Estimation Property Benefits**
  - ***Rate of Return***
  - ***Valuation***

# Baseline Assumptions

SOLAR CALCULATION WORKSHEET			
<b>Utility Consumption and Cost Baseline</b>			
Average Electric Rate	\$	0.1760	
Utility Cost Inflation Factor		3.78%	
Estimated Annual Electric Usage (kWh)		60,000	
Estimated Annual Electric Bill:	\$	10,560.00	
Average Monthly Electric Bill:	\$	880.00	
			Year from Bills    Mo from Bills
			-                      -
<b>PV System Design Assumptions</b>			
Solar PV System Design Size (as % of consumption)		95%	
Solar PV Generation Rating for Location		5.74	(Fresno)
Solar PV System Efficiency Factor		0.78	
Useful System Life (years) Remaining		20	
Solar PV Degradation (per year)		0.5%	
	<b>PV System Size</b>	<b>Minimum</b>	
Solar PV System Capacity Required (kW):	35.00	34.88	
Roof Area Requirements (sq. ft.):	3,500	3,488	
Estimated Net PV Generation(kWh):	57,196.23	95%	of total
<b>System Costs</b>			
Estimated Per Watt Installed Cost:	\$	8.00	
Estimated System Cost:	\$	280,000	
	<i>System Pricing Assumptions</i>		
		<i>Under 2kw</i>	<i>Over 2kw</i>
	<i>PV Product Cost/watt</i>	\$6.00	\$5.00
	<i>Inverter Cost/watt</i>	\$1.20	\$1.20
	<i>Installation Costs/watt</i>	\$2.80	\$1.80
	<i>Total</i>	\$10.00	\$8.00

# Incentives and Rebates

Funding Sources		% Covered	
Total Incentives:		\$ 164,850.00	59%
Sources		Per Watt	Other
(1) Utility Solar Incentives	\$ 115,500.00	\$ 3.30	\$ -
Balance of Costs:		164,500.00	
(2) State/Local Financial Incentives		\$ -	
Balance of Costs:		164,500.00	
(3) State Tax Credit Deduction		\$ -	
Balance of Costs:		\$ 164,500.00	
		% Cost	Cost Cap
(4) Federal Solar Investment Tax Credit	\$ 49,350.00	30%	\$ -
Balance of Costs:		115,150.00	
NET SYSTEM COST:		\$ 115,150.00	41%
		% Remaining	

# Debt and Maintenance Costs

## SOLAR CALCULATION WORKSHEET

### Debt Financing

	Monthly	Annual	
Monthly Debt Service Payment	\$ 609.78	\$ 7,317.30	
Annual Debt Service Payment		\$ 7,444.69	
Interest Rate		6.50%	
Loan Period (Years)		15	
Number of payments		180	
Amount of Loan	\$ 70,000.00	\$ 70,000.00	

Note: Assume use of Section 241 Supplemental Loan for 25% of system cost after 5 year PPA.

### Operating Costs

Annual PV System Costs/Reserve Contributions	\$ 3,326.67		
Operating Cost Inflation Factor	2.00%		
Less: Added Utility Fees:	\$ 60.00	\$60.00	
Less: System Maintenance Reserve:	\$ 1,400.00	10.0%	
Less: Inverter Replacement Cost Reserve (@ year 15):	\$ 1,866.67	\$28,000	

# Cash Flow Estimates

*Table of Project Energy Savings and Cash Flow After Debt Service  
Over 25 Year Useful Life*

	TOTAL ENERGY SAVINGS	NET ENERGY SAVINGS		CASH FLOW	NET CASH FLOW
Power Purchase Agreement Period	\$10,066.54	\$6,739.87	Year 1	\$2,749.23	(\$577.43)
	\$10,394.82	\$7,001.62	Year 2	\$3,077.51	(\$315.69)
	\$10,733.80	\$7,272.74	Year 3	\$3,416.50	(\$44.56)
	\$11,083.84	\$7,553.56	Year 4	\$3,766.54	\$236.25
	\$11,445.30	\$7,844.41	Year 5	\$4,127.99	\$527.10
15-Year Solar Investment Financing Period	\$11,818.54	\$8,145.63	Year 6	\$4,501.24	\$838.33
	\$12,203.95	\$8,457.59	Year 7	\$4,886.65	\$1,140.28
	\$12,601.94	\$8,780.64	Year 8	\$5,284.64	\$1,463.34
	\$13,012.90	\$9,115.18	Year 9	\$5,695.60	\$1,797.88
	\$13,437.26	\$9,461.59	Year 10	\$6,119.96	\$2,144.29
	\$13,875.46	\$9,820.28	Year 11	\$6,558.16	\$2,502.97
	\$14,327.96	\$10,191.67	Year 12	\$7,010.66	\$2,874.36
	\$14,795.21	\$10,576.19	Year 13	\$7,477.90	\$3,258.89
	\$15,277.69	\$10,974.30	Year 14	\$7,960.39	\$3,656.99
	\$15,775.91	\$11,386.45	Year 15	\$8,458.61	\$4,069.15
	\$16,290.38	\$11,813.13	Year 16	\$8,973.08	\$4,495.83
	\$16,821.63	\$12,254.83	Year 17	\$9,504.33	\$4,937.53
	\$17,370.20	\$12,712.06	Year 18	\$10,052.90	\$5,394.76
	\$17,936.66	\$13,185.36	Year 19	\$10,619.36	\$5,868.06
	\$18,521.53	\$13,675.26	Year 20	\$11,204.29	\$6,357.96
	\$19,125.60	\$14,182.35	Year 21	\$11,804.29	\$6,863.96
	\$19,749.30	\$14,707.19	Year 22	\$12,419.30	\$7,386.96
	\$20,393.35	\$15,250.39	Year 23	\$20,393.35	\$15,250.39
	\$21,058.39	\$15,812.58	Year 24	\$21,058.39	\$15,812.58
	\$21,745.13	\$16,394.40	Year 25	\$21,745.13	\$16,394.40
<b>TOTAL*</b>	<b>\$326,139.05</b>	<b>\$236,897.03</b>		<b>\$216,379.53</b>	<b>\$127,137.50</b>
<b>AVERAGE*</b>	<b>\$16,306.95</b>	<b>\$11,844.85</b>		<b>\$10,818.98</b>	<b>\$6,356.88</b>

# Estimated Benefits

Savings and Benefits		
First Year Energy Savings	\$10,066.54	
25 Year Energy Savings Total	\$379,863.35	
Average Annual Energy Savings	\$16,306.95	
Average Net Annual Energy Savings	\$11,925.33	(less operating costs)
Net First Year Energy Savings	\$6,799.87	
Energy Asset Value: (based on Cash Flow)	\$93,791.31	7.25% CAP Rate
Appraised Asset Value: (based on Energy Savings)	\$238,506.61	
Simple Payback (from average annual savings)	4.29	10.29
Simple Payback (w/ Property Valuation)	0.00	
Internal Rate of Return on Cash Flow	10.03%	
Comparative Return on Investment on Asset	135.67%	405.01%
Marginal Tax Rate	0%	0%
Energy Savings Value	\$ 379,863	\$ 379,863
Asset Book Value	\$ 280,000	\$ 93,791
	Annual	Lifetime
Green House Gas Emission Reduction (Lbs)	93,802	1,876,036
Green House Gas Emission Reduction (Tons)	46.90	938.02
	CO2 pounds per kWh	1.64
	Expected kWh Reduction	57,196.23



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