



A Simplified Example of a Residential Solar PV System

Assumptions:

South-facing, unobstructed, roof-mounted installation. (Azimuth 180°; Tilt 20°.)
 Standard performance efficiency and loss factors *
 Annual Solar Radiation: 4.58 kWh/m²/day * (in vicinity of Indianapolis IN)
 System Size: **5.0 KW** (5000 watt DC power output)
 System Components: **265 watt per panel** (~19 panels and a DC to AC Inverter)
 Average Cost of Electricity: **\$0.105/kWh** (Purchased from Duke Energy Indiana) ***
 CCSI Volume Discount: 150 – 180 kws installed which would be half-way to program goals ****
 Excluded: PV output degradation over years (-); Solar Renewable Energy Credits (+).

Investment:

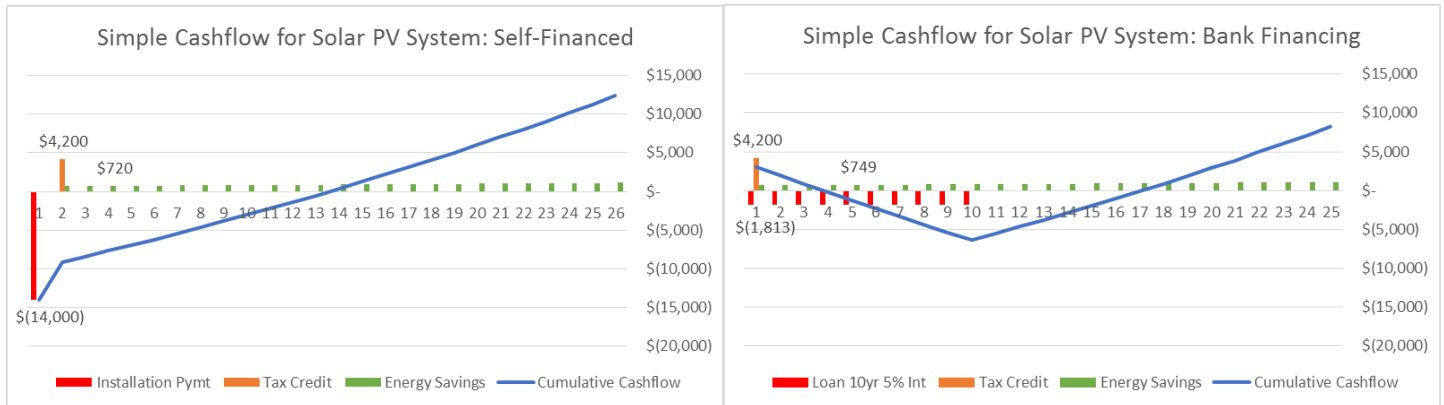
Base Price – Vol Discount: **\$2.80/w** (Base Price for 5KW System \$2.95 less Vol Discount \$0.15)
 Installed Price: **\$14,000** (= 5000 watts * \$2.80/watt)
 30% Fed Income Tax Credit: **<\$4,200>** (= \$14000 * .30)
 After Tax Cost of System: **\$9,800** (= \$14000 - \$4200)

Savings:

AC Energy Substituted: **6,589 kWh per Year from 5KW System ***
 Energy Savings: **\$692/Yr1** (= 6,589 kWh/yr x \$0.105/kWh; assumes utility inflation 2%/yr ***)
 CO² Avoidance: **86.5 Tons** (= 1.05 lbs CO²/net kWh** x 6,589 kWh/yr x 25 yrs / 2000 lbs)

Simplified Financial Analysis:

	<u>Self-Financed</u>	<u>Financed with Bank Loan (10 years @ 5%)</u>
Simple Payback:	13 Years	18 Years
IRR (After-Tax, 25 yr):	7%	4% (better if mortgage interest deduction taken)
NPV (5% hurdle rate):	\$1,799	\$1,889



<p>Self-financed: Pay \$14,000 to vendor. Receive \$4,200 in tax credit. Reduce utility bills by \$692 in Yr 1, and more each year thereafter as average utility rates increase.</p>	<p>Bank-financed: Borrow \$14,000 @ 5%. Pay vendor. Pay loan \$1,813 (\$72/mo) for 10 years. Receive \$4,200 tax credit. Reduce utility bills by \$692 in Yr1 and more as average utility rates increase.</p>
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Sources:

- * <http://pywatts.nrel.gov/> (Models a site's solar radiation, PV size, loss factors, azimuth, tilt, and shade to derive a sited system's AC output/ year.
- ** <http://www.duke-energy.com/pdfs/2013dukesustainabilityreport.pdf>, page 6 for the utility's pounds of CO₂ per net kWh generated.
- *** For a typical 1000 kwh/mo Duke customer, the estimated savings per kwh would be 10.5 cents per kwh, based on the July 1, 2015 Residential Bill Survey from the Indiana Utility Regulatory Commission. Model assumes 2% increase per year in average annual utility bills.
- **** See: CCSI Price Schedule Showing Base Price and Incentive.