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Estimating the Cost of Solar For Your Farm




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Base Pricing Your Solar System

10-kilowatt system (1 kilowatt = 1,000 watts)



$\$3.00 \text{ per watt} \times 10 \text{ kilowatts} = \$30,000 \text{ for system}$

This value includes installation

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USDA Rural Development U.S. DEPARTMENT OF AGRICULTURE


Rural Energy for America Program (REAP)

Renewable Energy Systems and Energy Efficiency Improvement

Offers grants and guaranteed loans

- Grants can cover up to 50% of project cost (*may not be guaranteed*)
- Requires that applicant cover remaining 50% (*or 25% if getting financing*)

What about the guaranteed loans?



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USDA Rural Development U.S. DEPARTMENT OF AGRICULTURE

Rural Energy for America Program (REAP)

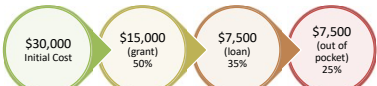
Guaranteed loan can help finance remaining cost

- Maximum amount: 75% of total cost or 25% if awarded grant
- Terms: up to 40 years
- Note: useful life of solar system is 30-35 years

Grant covered 50%, loan 25%, so must pay 25% out-of-pocket

Loan Example

- Interest Rate: 7%
- Terms: 20 years (match solar lease?)
- Loan amount: \$7,500 (\$30,000 x 25%)
- Annual installment: \$708



Wait, aren't there tax credits?

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U.S. DEPARTMENT OF ENERGY

Federal Tax Credit for Solar Systems


What is a tax credit?

- Dollar-for-dollar reduction on income tax owed (*what you pay*)

Solar system credit = 30% of project cost

Requirements:

- System is "new" and installed between 1/1/2017 and 12/31/2034
- You own the system
- Purchased with cash or financed
- Not leasing or selling electricity to solar company



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U.S. DEPARTMENT OF ENERGY


Additional Federal Tax Credits Available

10% Farms located in a low-income community

- Median family income of 80% or less of benchmark (*state median income for rural areas*)

10% Installation using domestic labor and U.S. made materials

- Note: labor must be paid prevailing wage (i.e., average wage paid to similarly employed workers)



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Other Tax Implications

REAP grants are considered farm income (taxable)

Solar energy systems are depreciable assets

Use of tax credits can limit how much depreciation is available

Depreciation could be used to offset income tax on REAP Grant

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Depreciating Solar Systems

- Considered a "5-year asset" or depreciable over 5 years
- Straight-Line Depreciation
- 200% or 150% Declining Balance
- 179 "Direct Expense" or Bonus Depreciation
- Can only depreciate costs after tax credits (ex. after 50% credit on \$30,000 = \$15,000)
- Evenly divided over 6 years (1st and 6th year are 1/2 years)
- Allows more upfront expense to reduce taxable income
- Allow depreciation of "almost" entire \$15,000 in Year 1
- 179 Direct Expense cuts off if Schedule F hits \$0
- Bonus Depreciation can force a negative Schedule F (limited to 80% in 2023)

Visit with Tax Preparer about "your farm situation" before using Tax Credits & Depreciation

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Solar Savings in Operating Costs

Average 2023 Michigan energy cost = \$0.19 per kilowatt
10-kilowatt system averages 10,950 kWh (kilowatt hours) per year

Break-even cost savings needed to cover loan payment:
\$708/10,950 kWh = \$0.06 per kWh

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Solar Savings in Operating Costs

Average 2023 Michigan energy cost = \$0.19 per kilowatt
10-kilowatt system averages 10,950 kWh (kilowatt hours) per year

Annual cost savings to replenish out-of-pocket costs
\$2,080 - \$708 = \$1,372

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Trade-Offs Do Exist

Weather does affect performance

- System will still work in snow, rain, or overcast days
- But may not be at peak performance levels
- Snow only a concern if heavy accumulation could cause physical damage

Occasionally need repair or maintenance

- Can cost \$20/kW per year (or \$200 on 10 kW system)
- Check with solar developer on potential costs

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On-Farm Benefits???

We've talked about covering the investment...

Now what about the cost savings on-farm???

Solar Savings – Dairy

Dairy farms use 800-1,200 kWh/cow-yr. How much is milk parlor related?

Milk cooling and pumping, Vacuum pumps, Water heating, Ventilation, Lighting, Long daylighting practices (photo-period control)

For 300 cow dairy:

30,613 kWh for naturally-ventilated barn w/ stirring fans and 6 automatic milking systems

30,613 kWh x \$0.19 per kWh = \$5,816.47

\$5,816.47 - \$1,880 = \$3,936.47
(parlor utility costs reduced by almost 1/3!)

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Solar Savings – Field Crops

Drying grain to remove 1% point of moisture needs 0.01 kWh per bushel

- Corn harvest moisture = 20.5%
- Dry moisture desired = 15.5% (difference of 5%)

Michigan farm with 500 acres of corn, average yield 180 bushels/acre

- 180 x 500 = 93,000 bushels
- 93,000 bushels X 5 percentage points X 0.01 kWh = 4,650 kWh
- 4,650 kWh x \$0.19 per kWh = \$883.50 per year

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Solar Savings – Field Crops

Breaking down savings

- Solar cost savings = \$1,880
- Dryer cost = \$883.50
- Savings after dryer cost = \$1,880 - \$883.50 = \$996.50

Using FINBIN database (finbin.umn.edu) for actual utility cost of MI farms

- Average utility cost = \$16.15/acre
- \$16.15 X 500 acres = \$8,075 per year

Overall Cost savings

- Reduced utility costs = \$8,075 - \$1,880 = \$2,965

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Solar Savings – Fruit

12 x 12 x 9 commercial cold storage

Month	Heating			Refrigeration			Circulating Fans and Lights	-Total-
	Heating (Btu/mo)	kWh/mo	Heat Cost	Cooling (Btu/mo)	kWh/mo	Cooling Cost		
January	220606	65	\$12.92	935570	110	\$20.90	269	\$51.11
February	107586	33	\$6.27	998719	117	\$22.23	243	\$46.17
March	0	0	\$0.00	1396363	164	\$31.16	269	\$51.11
April	0	0	\$0.00	1888260	222	\$42.18	260	\$49.40
May	0	0	\$0.00	2487550	293	\$55.67	269	\$51.11
June	0	0	\$0.00	2708388	326	\$61.94	260	\$49.40
July	0	0	\$0.00	2930126	345	\$65.55	269	\$51.11
August	0	0	\$0.00	2821733	332	\$63.08	269	\$51.11
September	0	0	\$0.00	2491730	293	\$55.67	260	\$49.40
October	0	0	\$0.00	2310927	272	\$51.68	269	\$51.11
November	0	0	\$0.00	1538727	181	\$34.39	260	\$49.40
December	115122	36	\$6.84	1092925	128	\$24.32	269	\$51.11
Annual	443314	137	\$26.03	23659028	2783	\$528.77	3166	\$601.54

Est. Yearly Electric Use 6086 kWh
Est. Yearly Electric Cost \$1,156.34

\$1,880 - \$1156 = \$724 additional savings

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Estimating the Cost of Solar Systems

Installation costs are manageable

- Rural Energy for America Program (REAP)
 - Grants or Guaranteed Loans
- Federal Tax Credit for Solar Systems
- Tax Depreciation Methods

Cost savings can:

- Reduce overall utility costs
- Offset out-of-pocket or debt payments

Depends on your design system:

- Purchase & Installation Costs
- Maintenance costs
- Potential cost savings

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Resources

Rural Energy for America Program (REAP)

- www.rd.usda.gov/programs-services/energy-programs/rural-energy-america-program-renewable-energy-systems-energy-efficiency-improvement-guaranteed-loans/mi

Rural Development REAP Factsheet

- https://www.rd.usda.gov/sites/default/files/fact-sheet/508_RD_FS_RBS_REAP_RE.pdf


Solar Tax Credit

- <https://www.energy.gov/eere/solar/federal-solar-tax-credits-businesses>

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